American Machinist

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A PLAN for MARKETING DURABLE GOODS

. . . selling his brain children as if they were lumps of coal, a package of pins or a cotton dress

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Arthur Lazarus & Company

SOMEONE recently said that durable goods were as high as they were in 1929. That is a mistake. Durable goods were never high; if they had been, these industries would not be in their present plight. The illusion of high prices exists because there is frequently a gratifying margin between the cost of production and the sales price of durable goods.

In periods of heightened business activity, the manufacturer of capital goods basks in a false prosperity. He has a nice bank balance and an alluring profit and loss statement. But what has he accomplished except to anticipate the business of the next two or three ensuing years? Then comes a prolonged business slump, and he twiddles his thumbs while his more fortunate brother producer of consumer goods is able to make both ends meet.

However high his selling price may be, the manufacturer of durable goods is profligate, tossing his goods away for a pittance. Here is a master creator, fulcrum of the industrial system, cutting his throat by following fallacious marketing policies, selling his brain children as if they were lumps of coal, a package of pins or a cotton dress.

The capital goods manufacturer has been aping marketing policies of the man who makes things that are used up year in and year out and for which there is bound to be an irreducible minimum demand.

The manufacturer of durable goods has been thinking too much of each sale, as an end in itself. He has been concentrating on each immediate profit. That worked out enormously well when our industrial development seemed limitless and foreign markets beckoned, but the marketing policies pursued were not designed for survival in a period of declining sales or in an industrial hemisphere that was actually contracting.

The manufacturer of durable goods is the salt of the industrial world. To throttle him is unthinkable, for he it is who supplies the research and applied technology which has made so much of our industrial progress possible. A new marketing approach for durable goods is necessary, founded on experience and analogy. Even so, no formula is attainable which will apply equally well for all manufacturers. Each producer of durable goods must size up his own situation and shape

his distribution accordingly, but the focal point about which all manufacturers of durable goods can converge is a better understanding of obsolescence.

There are many engaged in industry who regard obsolescence as a mysterious, uncontrollable, eruptive and unpredictable element, defying analysis and regulation. Only a few years ago producers held up their hands in horror, decrying the devastating effects upon profits of style and design, but when industrial designers and others began seriously to study and analyze the styling process, we came to realize that there was a certain sanity and progression in the unfolding of a specific style, and that through planning, analysis and coordinated effort, we could convert style and design into stimulating contributors to profits, as well as to the aesthetic life of the country. Similar leadership is needed with respect to obsolescence.

Excess Mostly Obsolete

We know that obsolescence proceeds in good times and bad. Depressions do not crush inventive instinct. We hear a great deal of over-productive capacity, but we forget that much of such capacity is physically but not economically available. Any reasonable burst of activity will find us using obsolete plant and equipment.

I take an illustration from the newspaper field. In an interesting report to his board of directors on the subject of obsolescence in the metropolitan newspapers of the United States, Henry A. Wise Wood, president of the Wood Newspaper Machinery Corporation, has this to say:

> "A careful study of the plants of one hundred and five newspapers in the United States and Canada having circulation of approximately 100,000 or more, now using obsolescent machinery, indicates that the need for replacement, calculated in sales price of new equipment, amounts approximately to $44,000,000 in three departments, broken down into requirements as follows:
>
> $ 6,568,000 in the stereotype foundry
> 26,045,000 in the pressroom
> 11,354,000 in the reelroom"

Mr. Wood gives two reasons for the state of obsolescence, (1) revolutionary changes in time- and money-saving mechanisms, which have occurred since 1928, and (2) the fact that but little equipment of any kind has been purchased except by a few enterprising publishers.

The situation in the newspaper field is not an isolated one. The same story can be told time and time again for

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many industries. This brings us to the second fact—that present methods of providing for obsolescence are inadequate. This is customarily done by charging an expense account called Depreciation and crediting a reserve account called Allowance for Depreciation. Heavy taxation and a long period of cost education, has tended to liberalize these charges, so that current costs reflect ordinary wear and tear; but every so often, it is still necessary to make heavy write-offs directly against the profit and loss account for property and equipment that has been superseded by something more effective. There is a job of that nature to be done right now, after a long period of concentrating manufacturing facilities into specific purpose plants.

Reserve But No Cash

Objection, however, is not made to the amount set aside for obsolescence through the depreciation charge. The trouble lies in the fact that this procedure is an accounting makeshift. We are suddenly realizing that those we scoffed at were right, that we need *funds* to replace obsolete plant and equipment and, that in times of depression, of little business when plants should be modernized, and producers of durable goods need to be kept going, these funds are not available. There is a growing impression that we require a more systematic method for dealing with obsolescence.

There are many shades of opinion as to how this is to be done, and each viewpoint has merit. For example, J. C. Knapp, vice-president of the Otis Elevator Company, distinguishes that part of plant investment which deteriorates from that which does not, and for the deteriorating elements he advises systematic spending, which would keep architects, builders and contractors employed. I quote from an address delivered by Mr. Knapp in 1932 before the Architectural League of New York:

> "Obsolence insurance virtually says to the building owner: you have already provided a bookkeeping fund to compensate you for the total loss of your building in years to come. This you call an Amortization Reserve. Instead of a mere bookkeeping entry, why not spend a part of this fund for the renewal of what really deteriorates and save the building. Use it for the purpose of maintaining your property at its full earning status. With such a regular and continuous program of modernization, the outlay will be found to be very moderate. You can pay for this modernization program as an integral part of the building's operation; and it will prove a scientific protection against Time, Wear and Tear. In fact, it will prove just as practical as your insurance against fire hazard—and just as necessary."

Mr. Knapp employs the term "obsolescence insurance" in a philosophical sense. There are those who feel that obsolescence insurance can be worked out as a practical underwriting proposition. It may seem laughable at first, but the fact is that some obsolescence insurance is being written, principally on buildings and for industries with a long industrial history, such as cotton manufacturing. It is my understanding that a group of New England factories are experimenting with the idea, and we certainly have not heard the end of it.

In Germany several insurance companies were formed to write obsolescence insurance. It is frequently described there as property-life insurance. The difference between life insurance and property insurance, such as fire and casualty, is this: life insurance provides for a contingency certain, namely death, while fire and casualty insurance cover a risk that may never occur. In fact, which it is expected will not happen.

Property-life insurance combines the characteristics of both kinds of insurance. It proceeds on the theory that buildings and machinery, as well as humans, give out and that insurance can make available a lump sum for all eventualities in the life and decay of property.

If property-life or obsolescence insurance could be worked out, the problems of the durable goods manufacturer would be substantially solved, because he would be assured of a

steady replacement market; but the problems involved from an underwriting standpoint are considerable, and it is reasonable to assume that it will be a long time before obsolescence insurance can measurably influence the marketing practices of the durable goods producer. Nor can he wait until the user of his products adopts the practice of setting aside actual funds instead of being content with a bookkeeping entry.

And so the chief responsibility for meeting the problem of obsolescence falls upon the durable goods manufacturer, where it belongs, and he certainly cannot continue the practice of selling his product, collecting his price, and considering the transaction as closed. A remarkably able manufacturer of equipment said to me the other day, "They (meaning his customers) don't like to have me bother them. They seem to forget what I have done for their industry. They consider me almost a nuisance, because they want to be left alone, and I am constantly bringing out new and better machines, which upsets them."

There is the crux of the matter; a benefactor of the industry, this inventive genius is considered a nuisance.

An Enviable Record

In this disconsolate mood, I turned to an old friend, Moody's Manual of Industrials for 1934; and what did I find? Here is a recital of profits over a series of depression years, of a company whose fiscal year ends February 28:

1934.....	$9,458,016
1933.....	6,023,483
1932.....	7,483,540
1931.....	8,351,987
1930.....	9,670,923
1929.....	8,394,082
1928.....	8,454,964
1927.....	7,985,041

In this recital of earnings there are no staggering deficits even in the worst years of the depression. On the contrary, profits are substantial. "Fine," you say, "but you are telling us about a manufacturer of consumer goods, let us say a food product." By no means, this happens to be the earnings record of the manufacturer of durable goods, the United Shoe Machinery Company.

I am aware of the fact that this company has a quasi-monopoly founded on patents, that it sells its machinery to users who turn out goods for consumption, and that there are well-established marketing practices in the durable goods field which are not easily changed. It is not expected that other manufacturers will adopt this company's selling methods without modification. If that were possible, it would have been done long ago, because they have been a matter of public knowledge.

The United Shoe Machinery Company early in its history made the discovery that it was not selling a commodity but a service. The policy of the company is not to sell its machinery but to lease it on a royalty basis. In this way it has been able to broaden its market and to stabilize its earnings. In the famous Supreme Court case, involving the validity of the selling practices of the company, the Court said in part: "The testimony shows that the advantage of the lease was and is that manufacturers of not large means were able to obtain machinery which they were without capital to buy. They helped, indeed, the big and the little. One manufacturer whose output was 5,000 paris of shoes a day, testified that if his company had been compelled to buy outright the machinery necessary to equip its factory, it could not have developed as it had."

Now what does this mean to the durable goods manufacturers for the practical exigencies of the moment? It means this, that when his machine leaves the shop to enter the premises of a customer, his relation thereto has just started and not ceased. Otherwise he will always be in the position of humbly awaiting his turn at the business soup-kitchen, and he can just as well understand that he will be served last. From a selling viewpoint, he will, where he can, lease his machine on a royalty basis. That is the old conception taken from the practice of the United Shoe Machinery Company.

And now for the new. Whether he sells his product outright, or leases it, he will couple with the transaction, a servicing arrangement, under which he will stipulate, not only to keep the machine in good running order, but to replace it with a better machine, without additional cost, whenever his inventive skill has made the old machine or equipment obsolete.

Obsolescence Fee?

A simple illustration will show how this might work out. The Otis Elevator Company is favorably known as a manufacturer of elevators. These it constructs and installs. But it also offers a monthly service for the complete maintenance and repair of elevators, the cost of which, I believe, has been tending downward. Might it have been preferable not to reduce the monthly charge, or to increase slightly the present service fee, so that this manufacturer would be able to maintain and repair an elevator, and to install, as well, without additional cost, a new, improved type, when the old one becomes obsolete?

This resolves itself into a matter of arithmetic, tempered by judgment. Past records will show at what rate elevators become obsolete. Past records will also show the average selling prices of comparable models. It is then a matter of judgment to determine what small monthly premium, with interest compounded, will accumulate enough in a given span of years, to provide a new elevator. Infinitely more difficult problems have been solved by insurance actuaries.

. . . humbly awaiting his turn at the business soup kitchen and he can just as well understand that he will be served last

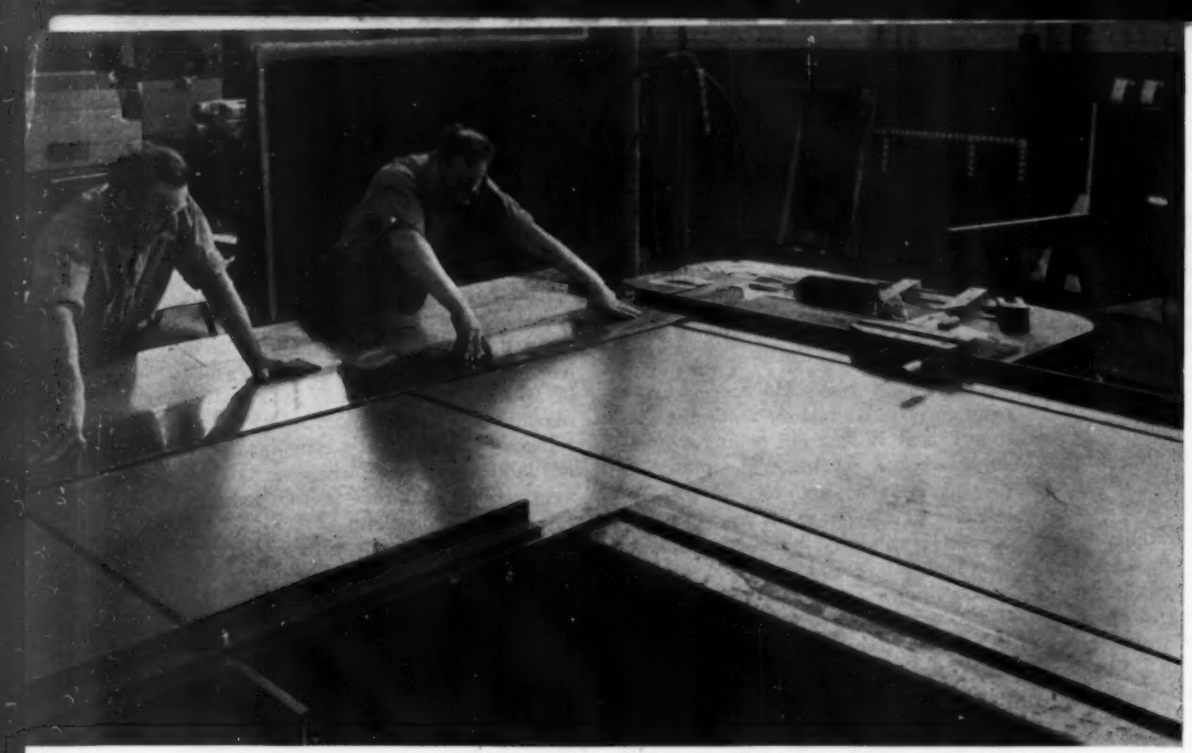

Fig. 1—Micarta doctor blades are sawed on a stationary table with the blade moving at a speed of approximately 3,000 revolutions per minute

Shop Operations on LAMINATED PLASTICS

E. L. WOLFE

Westinghouse Electric & Manufacturing Company

Recommended methods of machining plastics gain more importance through the widening use of these materials

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LAMINATED phenolic or urea materials are in some cases molded into the shapes desired and in other cases molded into flat plates and then machined to specific applications. Micarta, manufactured by Westinghouse, belongs to this group of materials.

Because of the versatility of applications to which laminated plastics may be applied, their use has expanded rapidly during the past few years. Increased use has frequently brought demands for information from those not familiar with the material to enable them to handle it satisfactorily in their processes. Correct methods of handling this material will result in more economical processing and eventually spread its usefulness.

The best methods of machining laminated sheets, rods, tubes, angles and other molded forms are not generally known and are confined largely to actual users who, in many cases, have had to create their own technique by cut-and-try methods.

It is impossible to lay down precise rules covering the subject, since many grades have been developed for particular uses where certain features in the material itself are required. Various requirements of flexibility, hardness, porosity, mechanical strength or electrical qualities, or a combination of them, require slightly different methods in machining.

Laminated plastics combine the strength of steel with the adaptability of wood and the insulating qualities of rubber or porcelain. They can be sawed, drilled, tapped, punched, milled or turned with ease. The machinist who is in doubt should make his set-up for any operation, just the same as he would if he were about to machine brass of any of the soft metals, regardless of whether the operation be sawing, drilling, tapping, punching, milling or turning. This rule is valuable because it is easy to remember. But, for best results, it is wise to follow

methods set down in the following paragraphs.

Either bandsaws, circular saws or carborundum wheels can be used satisfactorily in sawing laminated plastics.

Band Sawing

When making curved cuts on any thickness or straight cuts on material 1 in. and over in thickness, a bandsaw is used. Any good wood-cutting machine, rigidly made with a metal table, is suitable. The saws, ranging from ¼ to 1¼ in. in width, depending on the thickness of material to be cut and the curvature of the cut, will give good results when run at approximately 4,000 f.p.m. Saws should be of the bevel-tooth type with seven teeth per inch.

The teeth of the saw should be sharpened straight across and sufficiently set to make a cut at least twice the thickness of the saw, thereby giving it no chance to heat except by the contact of the teeth with the materials.

Ball bearing guides should be used and care exercised to see that they are adjusted so that there is no possibility of the saw being set so far back between the jaws of the guides that it will smooth out the set of the teeth.

Circular Sawing

When making straight cuts on material under 2 in. in thickness, a circular saw will give good results. The all-metal wood-cutting type of machine, with a movable table, will be satisfactory on sheets under 48 in. square. For sheets 48 in. square and larger, a stationary table with a movable saw is desirable.

Saws should be 12 to 16 in. in diameter and run at a speed of approximately 3,000 r.p.m. Where saws are well guarded, they may be run at higher speeds with good results. For rough cuts, the teeth on the saw should be beveled, and for specially smooth cuts, a smooth saw with no set, similar to that used for metal, should be used. The saws should be made of high-speed steel of the metal-cutting type with approximately seven

Fig. 2—Turning is done on a metal-working lathe using high-speed steel; a tungsten-carbide or diamond tool may also be employed

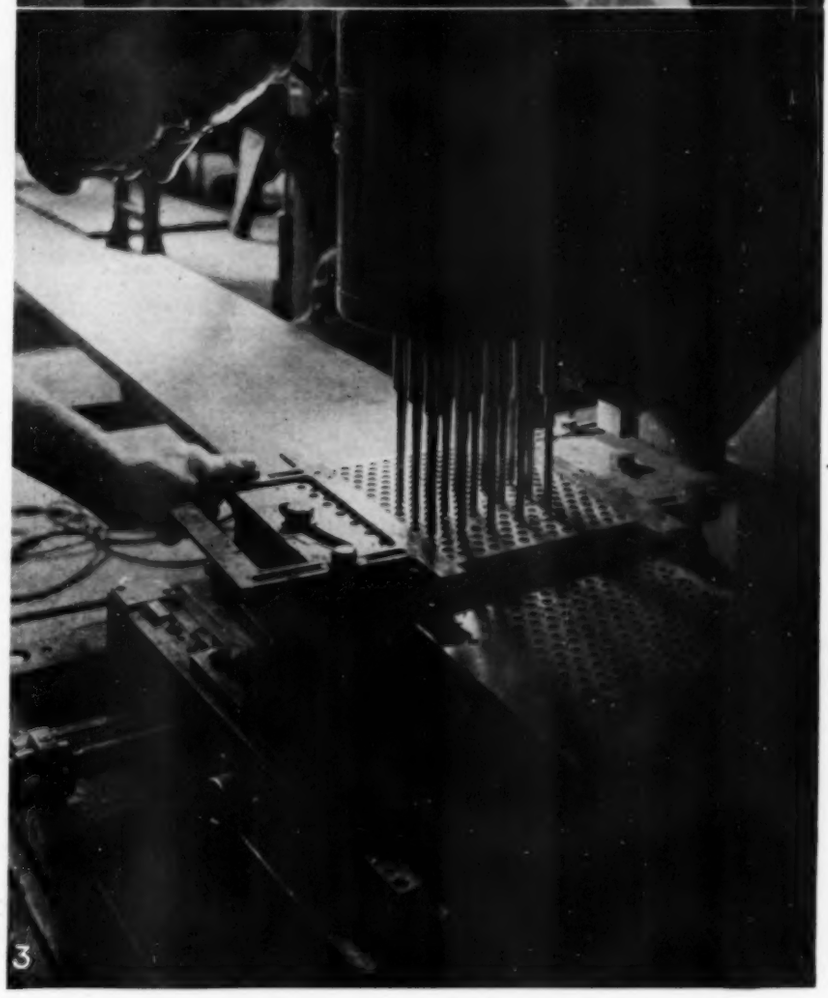


Fig. 3—This suction box cover is drilled dry using a plate jig adaptable for a number of sizes

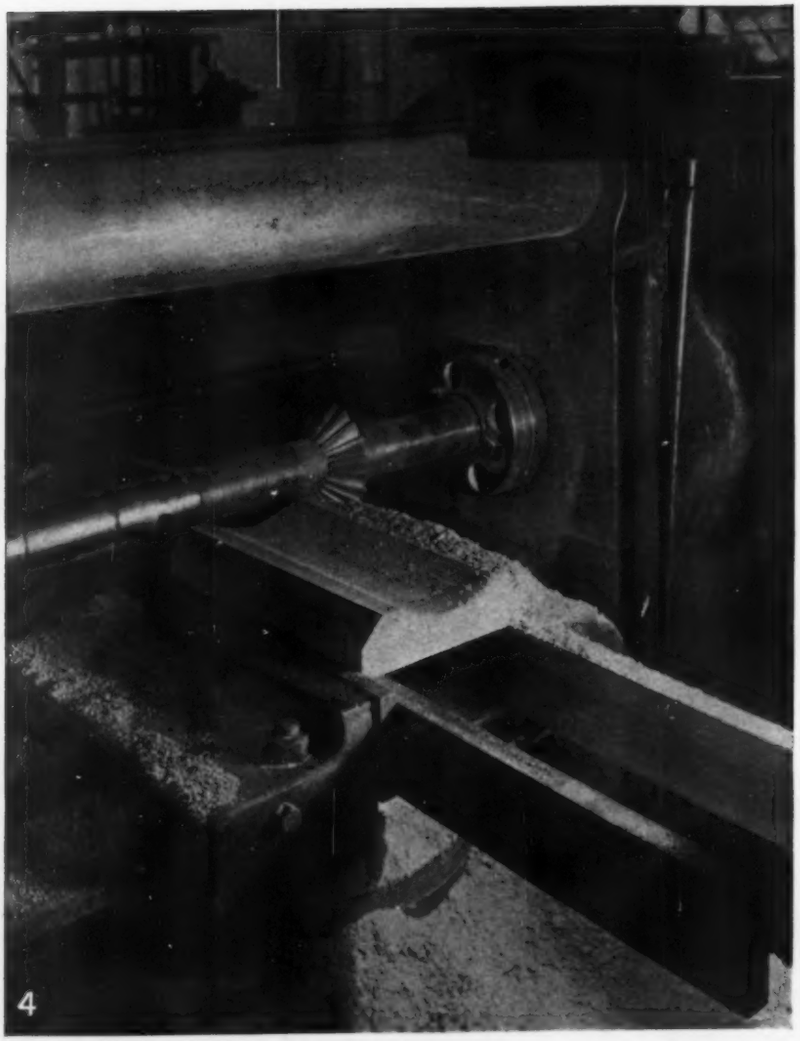


Fig. 4—A Micarta bearing is milled using a standard set-up and a cutter speed the same as for bronze

teeth per in. When sharpening the teeth, use a 20 deg. angle, right and left, which creates staggered points. This will prevent chipping of the edge of the material when sawing panels or strips.

For especially hard materials, such as phenolic-asbestos combinations, a specially developed carborundum wheel produced by a reliable manufacturer can be used to good advantage on a table with a movable saw.

Turning

Metal cutting lathes should be used with high-speed steel tools in turning laminated plastics. Tool bits should be ground without any rake and should have plenty of clearance; 30 deg. works well, but in some cases as much as 60 deg. can be used to advantage.

Where two cuts are taken, a roughing and finishing cut, about 0.010 in. stock should be left for the finishing cut. Coarse feeds may be used, especially for the rough cuts. The speed should be between 200 and 400 f.p.m. If any of the tungsten-carbides are used for bits, the cutting speeds may be increased, with a resultant decrease in tool grinding. If a diamond-pointed tool is used, the diamond should not be allowed to become too dull, as this will give a rough finish and may cause sufficient heating to damage the setting. In spite of the higher costs for tungsten-carbide and diamond-pointed tools, they have proven economical on many classes of work.

Drilling

For drilling laminated plastics high-speed drills with the lips ground off to provide plenty of clearance should be used.

With subsequent drilling, the drill should be lifted frequently from the work to prevent excessive heating of the tool. This is particularly important when drilling deep holes because of the resinous nature of the material; the chips cause a great deal of friction, and the heat generated causes them to become gummy quite readily, if not freed from the tool. No lubricant is necessary, but it will be found helpful if a small can of water is kept close to the operator and lifted up under the drill every now and then in order to cool it.

Drills may be fed rapidly, but not forced, and should be run at high speeds as for brass.

Particular attention should be paid to the direction in which the drilling is done with respect to the layers of material. In drilling parallel to the laminations, care must be taken to prevent splitting. This can best be prevented by clamping the material in a vise and using "flat" or "bottom" drills. In drilling perpendicular to the laminations, this precaution is not necessary, but care will have to be exercised so as not to split the material out on the back side, as the drill is pushed through. This can best be prevented by backing up the plastic with some stiff material such as wod or stiff cardboard.

Ordinarily a drill cuts smaller than itself in laminated plastics, making a hole a few thousands smaller than the drill. This may be overcome by grinding the drill slightly off center.

For large holes, ¾ in. diameter and over, a better method than using a drill would be to secure the material in a lathe chuck and remove the stock with a boring tool.

Milling

When milling laminated plastics, a standard tool should be used at a speed and feed corresponding to that used in working bronze or soft steel. The cutting angle of the mill, if ground with a slight rake, will give better results.

Threading

The threading of laminated plastics may be done with both solid and self-opening dies. Small threads are more easily made by solid or adjustable dies, as the self-opening dies often tear off the thread in opening. Threads can also be cut in a lathe with tools ground without rake but with plenty of clearance. When cutting threads

on a lathe, it is best to grind the tool on one side only.

The tools in all cases must be kept sharp, and the use of turpentine, or a light oil, will assist greatly in obtaining clean threads. The threads may be cleaned by using a fine wire brush or a stiff hair brush.

There may be slight variations in the methods used for the various grades being threaded, but any machinist with reasonable experience and a little imagination will be readily able to make adjustments for the easiest and most efficient method of handling.

Tapping

When tapping holes, they should be drilled slightly larger than would be required if the material were metal. Either use a drill slightly larger or else a drill of correct size, but ground somewhat off center. It is well to experiment to find the size of hole that can be tapped out without binding on the tap and still give full threads. When tapping is done parallel to the laminations, it is always found advisable to clamp the material to equalize the stress on the material and thus prevent possible splitting.

Punching

Laminated plastics lend themselves admirably to piercing, blanking and shaving operations. However, on the different grades, the results will vary somewhat, depending upon the thickness of the material and the physical and electrical properties desired.

When making dies for punching this material, the punches should be made to fit the dies very closely. Approximately 0.002 in. clearance should be allowed betwen the punch and the die.

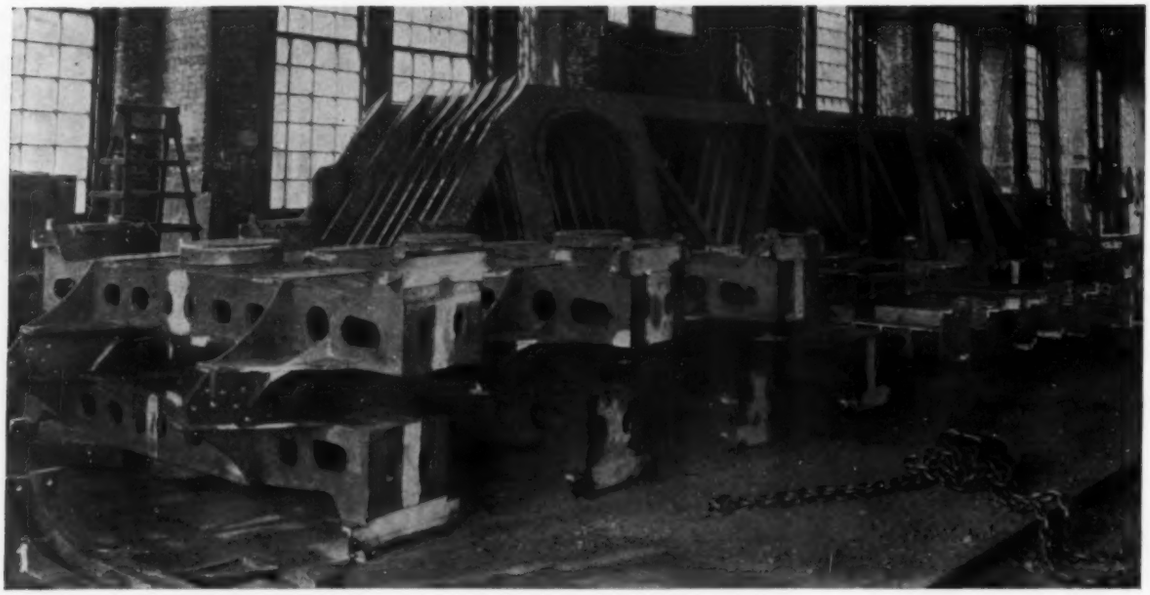
Since there is shrinkage in the holes after the punch leaves them, it is necessary that the punches be made larger than the required dimensions of the hole, by an amount equal to approximately two per cent for material punched cold and approximately four per cent for material punched hot.

The die consists of a punch which pierces the sheet pushing out a blank; a die, which the punch slides into, and into which the blank is pushed; a stripper, which pushes the blank out of the die or off the punch; and a guide plate, which guides the punch. The punch and die must be kept sharp at all times to obtain the best results.

A safe practice to follow in punching laminated plastics is to leave a distance of three times the thickness of the material between adjacent punchings and between punchings and the edge of the strip. For the more flexible grades this distance can be decreased somewhat. Where a blank containing holes is punched with a good compound die, a distance between hole and edge of punching of half the thickness of material should give satisfactory results.

Should be material show a tendency to break or crack when being punched, it should be heated to make it punch more easily. This is done by placing it in an oven heated to a temperature of approximately 125 C. The material should be left in the oven long enough to be thoroughly heated through, but no longer, as continued heating makes the material more brittle and harder and, of course, more difficult to punch.

Fig. 5—Punches must be slightly oversize to allow for shrinkage of the plastic; if the material has a tendency to crack, heating helps to prevent it



Structural steel inner cab trusses and cast steel cross members ready for assembly

Electric Locomotives—II

FRED H. COLVIN

Editor, American Machinist

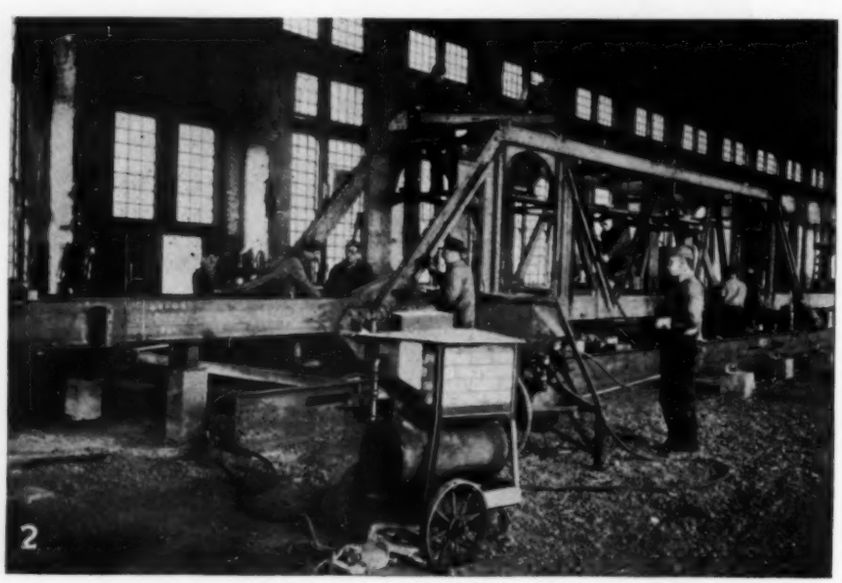
IN THE FIRST part of this article it was mentioned that the construction of the new Pennsylvania electric locomotives was divided among three plants, the Baldwin Locomotive Works, the Pennsylvania Railroad shops at Juniata and the General Electric Company. The methods employed by the Baldwin Locomotive Works were then described. The following tells of the practice employed at Juniata in building the cab and deck structure for these locomotives.

In the development of the cab it was decided to build a full size wooden model showing a half section of the cab. After this was fully constructed, the dies for forming the sheets were developed from this model, including the dies for forming the end roof sheet, marker light, the end hip sheet, motorman's compartment window sheet and center connection sheet, door header dies, and post and carline dies. The sheets pressed in these dies were deep drawn steel similar to that used in automobile body construction, except that it was of considerably heavier gage. All the dies used in pressing were draw dies.

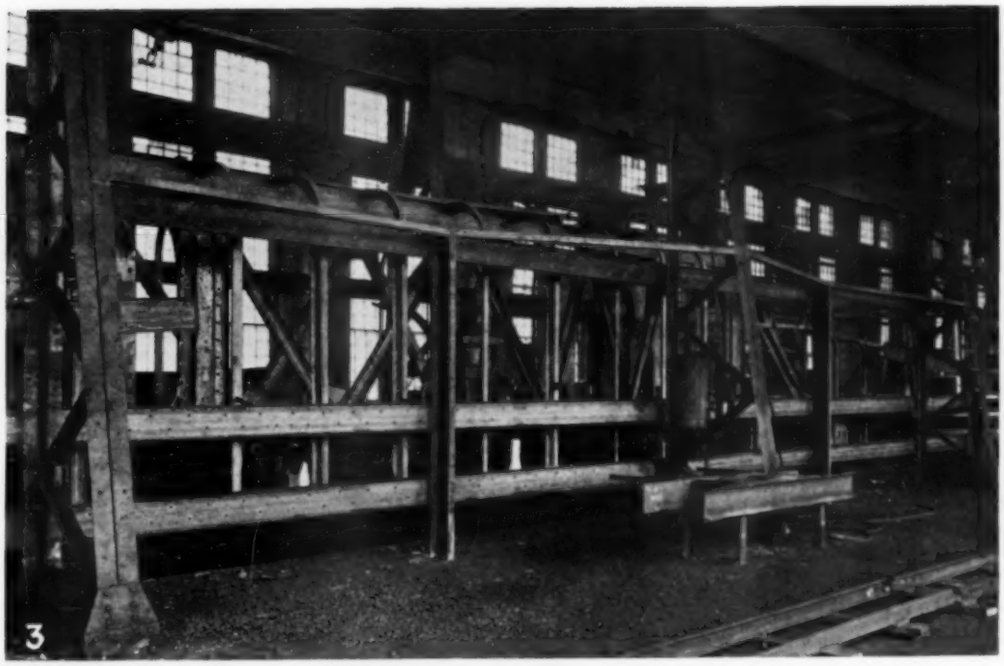
In building the deck structure, the side trusses as shown in background Fig. 1, were first assembled, welded and riveted on jigs specially designed for this purpose. The bolster castings and cross bearings shown in this figure were then placed in the specially constructed jig as shown in Fig. 2 and the trusses assembled around these castings. After this structure was completely riveted and welded it was placed on temporary trucks and moved down the runway, the air duct system built up and the framework completed ready for the application of side posts.

Following completion of the superstructure on this runway, it was moved to a second runway, specially equipped for the application of side sheets, louvres and other pressed parts.

Some of the uprights carry special platforms as shown in Fig. 4. These platforms can be raised to any desired

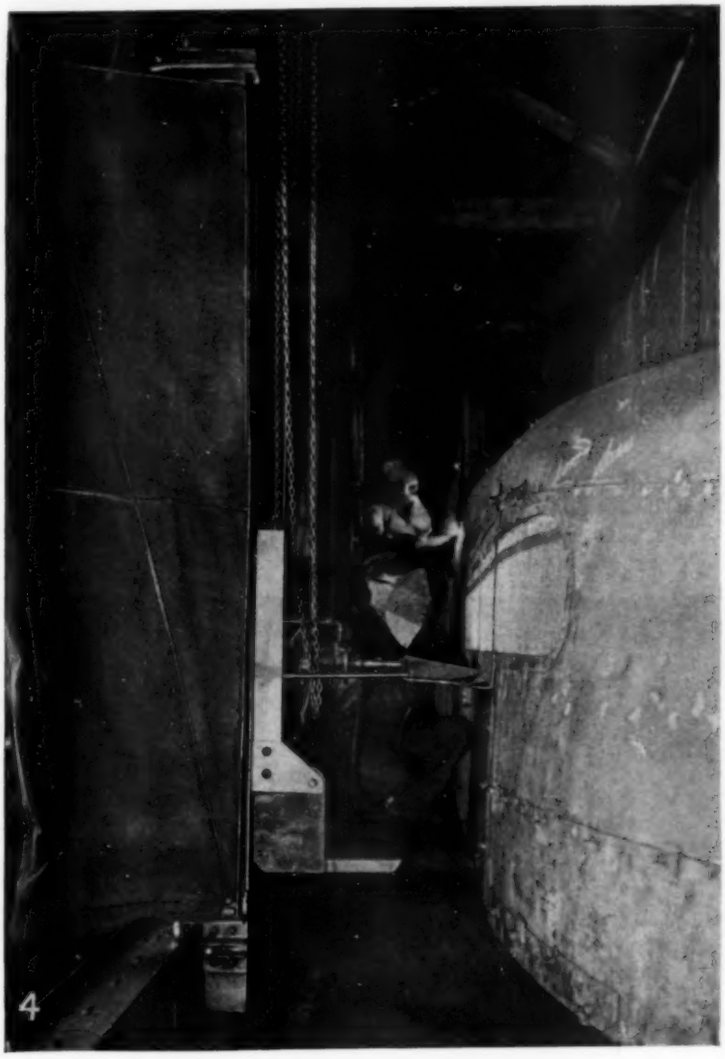


Inner cab trusses mounted on leveling blocks while being assembled to the long underframe and formed into a complete unit



Steel frame work in which the frame and the covering of the cab is aligned and erected

Close-up of riveters at work inside the erecting frame work. One of the pneumatic holder-ons is shown in center



height and add greatly to the safety and comfort of the operators. The pneumatic holder as shown in Fig. 4 is of great assistance in keeping the plates in position during the welding. The curtain shown at the left usually hides the welding arc but has been swung back to permit the photographs to be taken. Arms can be swung down at the ends of the platform to act as guards to prevent the welder stepping off the end.

This latter work was handled at the runway position shown in Fig. 3, the posts being applied with the use of a special jig which insured proper spacing of the posts and correct width and alignment of cab. The posts were held securely in place by this jig until the work of welding to the framework was completed.

To facilitate assembling of the sheets containing the motorman's windows, jigs were provided to which these sheets were fitted and welded as shown in Fig. 5. As completed on these jigs, these sections were ready for application to the cab structure on the runway.

This position was specially equipped for this work by the installation of four movable scaffolds, Fig. 4, carried on a steel framework. These scaffolds were equipped with roller bearings and chain hoists and could be readily moved in a longitudinal or vertical direction by the operators who performed the welding operations. Each scaffold carried a 4-in. cylinder having a plunger with foot bracket attached. These brackets contained a series of large holes properly spaced and performed the same function as the welding plates above referred to, the air cylinder forcing the bracket against the sheet and holding it in position during the welding operation. Incidentally this bracket absorbed much of the heat while welding was in prog-

ress and helped to prevent buckling.

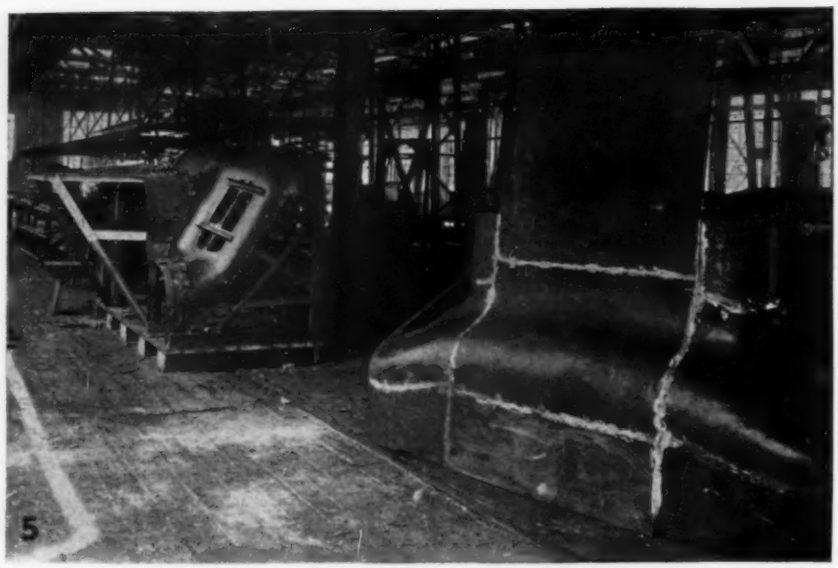
Fig. 6 shows the cab structure on the runway during the application of the outside sheets. All cab sheets are drilled for welding to the structure, the sheets being stacked for this operation and the holes drilled on a 3-in. spacing. In fitting the sheets to the structure, certain of these holes were used temporarily for bolting through holes in the framework to secure the sheets in position prior to welding.

At locations such as the ends of the cab, where contours changed, the sheets were supported during welding operations by means of plates provided with large holes giving access to the holes in the sheets through which the plug welding to the structure was done. Following this operation, the work of welding the seams of such sheets was completed. The cab was then moved to the next runway position for the welding of flat side sheets and roofs.

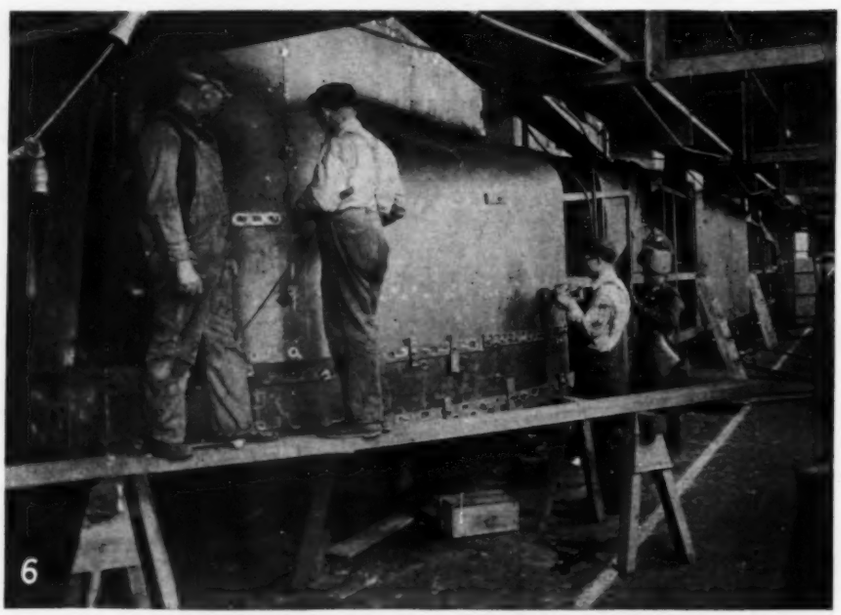
After the completion of the plug welding the cab was moved to the next position, where all welding was ground to a smooth surface and primed, after which the cab was placed on chassis, as shown in Fig. 7.

In this connection, the side frame of the cab proper was of Z bar construction; these Z bars were pressed in a die specially constructed for forming these sections.

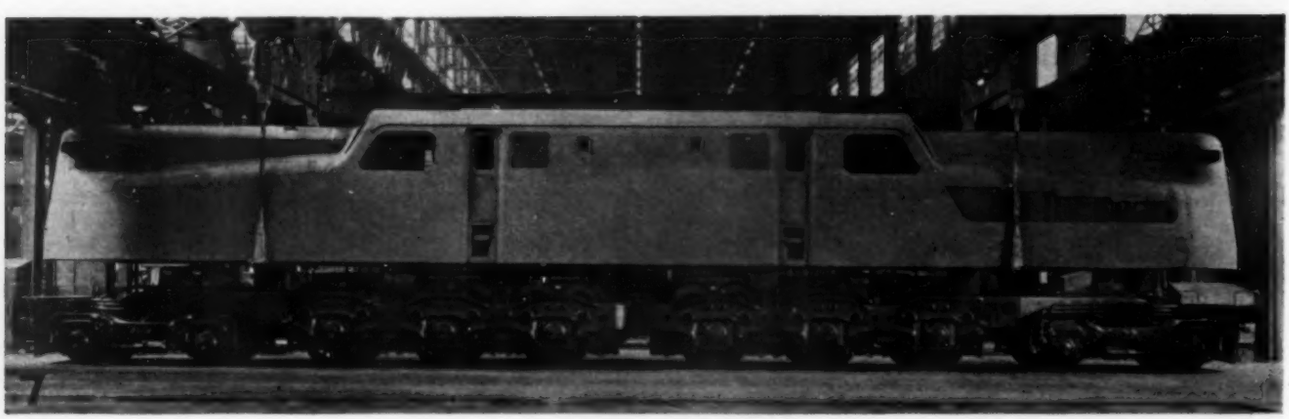
After the cabs were placed on chassis, they were glazed, the rubbing operation on this glazing was performed by use of three specially designed rotary rubbing machines. The painting operations which followed the rubbing, consisted of application of color, gold leaf and varnish, and was performed in a building specially fitted up for this work, so that it would be free of dust and have proper temperatures for drying of the various coats.



Frame work or form on which the cowl in front of the cab is held for welding. Cowl shown at right



Clamps through which sheets are welded. Grinding welded surfaces to present smooth exterior



Completed locomotive before being given its finishing coat of paint and lettering

The World's Greatest Machine Shop

CARLYLE said:

"Man is a tool-using animal—
without tools he is nothing,
with tools he is all."

Photo by Pach Bros.

WILLIAM P. KIRK
Vice-President, Pratt & Whitney Company

•

Chairman, Exposition Committee
National Machine Tool Builders' Association

FOR UNTOLD CENTURIES man has tried to find easier ways of doing the things that must be done for his existence. Beyond these necessities he has searched for more comforts and more pleasures. His needs and desires for "things"—whether for necessity, comfort or luxury—preceded any means of making them. The need (or demand) for his earliest types of tools existed before the tools were developed. It was the need that brought about the "invention."

As his desires for more comforts and more luxuries increased, he became more resourceful in means and methods for making those things which would provide the comforts and produce the luxuries. When he could produce more of a certain comfort or luxury than he needed, he began to barter with other men for their type of product in exchange for his surplus, and thus commerce began. As the demand grew, better methods of making things became necessary, and this condition is as true today as when man fashioned his first crude tool. From 1765 until 1774, Watt's steam engine existed only on paper because no machine had been developed that would bore the steam cylinder with "sufficient precision."

The primary purpose of the 1935 Machine Tool Show is to gather together in "The World's Greatest Machine Shop" machines that are superior in some way to similar types of machines exhibited in previous shows and to impress upon executives *en masse* that there is still a fundamental law of "survival of the fittest." But there is another side to this show, of interest to men, women and children who are outside of the metal-working industry and who know nothing about it except that they have been told how the "Machine Age" affects them adversely.

This vast exposition of machine tools of 1935 will show approximately $4,000,000 worth of products, covering a total floor space of approximately 250,000 sq.ft. and over 900 individual machines in more than 600 types, that have been created to make the necessities, comforts and luxuries that these men, women and children today are taking for granted as they do their right to live. These machines and their accessories represent not only the product of a great industry but the present-day stage in the evolution of man's attempt to raise himself above other animals.

As some men are continually creating new things to meet needs, and to provide more comforts and luxuries, others are developing machines for producing these things. The result of this labor is production at a cost which permits greater numbers to own and enjoy these things.

It is obvious that as the market grows there will be more employment in production, distribution and servic-

ing. It is most unfortunate that the wrong interpretation has been put on the term "labor-saving machines" by those who have motives that are not always for the best interests of the masses to whom they appeal for support.

The high-production machine which is sometimes misnamed "labor-saving," is really a maker of employment, for without it thousands of articles could not be produced at a cost within the reach of millions who now enjoy them.

Costs Cut for Everyone

The automobile is mentioned most often as the outstanding product of super-production. A brief glance at the increase in the number of automobiles in use between 1905 and 1935 should be a sufficient answer to the employment question. In 1905, when automobiles were made practically by hand, a good car cost its owner at least $5,000; as production machinery has become perfected, the cost of production has decreased until, today, the man who operates a production machine not only can, but does, own a better car than could his employer in 1905. One has only to notice the employees' automobile parking spaces at every factory to accept the truth of the above statement.

The contention that the number of man-hours per automobile has been reduced cannot be denied, but the use of the labor-saving machine which has made this reduction possible has also made possible a reduction in cost to the user, thus bringing about greater demand. The employment resulting from this increased demand is even more far-reaching when one considers the vast facilities necessary for servicing and the thousands of miles of improved roads in use today.

The question was asked recently: "Where would you draw the line on labor-saving machinery?" Every power-drive machine is a labor-saver. Those who want to be honest admit that labor-saving, high production, cost-reducing machinery, or whatever name one may give it, creates employment. Every new development and refinement in production machinery makes opportunity for more men to obtain employment. The making of production machine tools requires the work of men of highest skill. In normal times all the skilled mechanics are employed in building tools and other machines. Although operators of production machines become skilled in their operation, it is not necessary that they be skilled mechanics in the same sense that the builders of the machines are skilled. For this reason, the opportunity for gainful employment is opened up to a very large field of men who might otherwise be forced to remain satisfied with less lucrative employment.

The great purpose of the 1935 Show is to display to the people new methods of producing more wealth at lower cost with less manual labor per unit.

Another purpose is to bring a realization in the minds of the people that, due to the highly developed machine tool industry, the necessities and luxuries of life have been brought within the reach of more people; and third, that the machine tool industry is the nation's second line of defense, for without modern machine tools no nation could withstand the attack of an enemy.

The members of the National Machine Tool Builders Association have a right to be proud of their accomplishments since the 1929 Cleveland Show. Every man interested in industry, from banker to machine operator, will be benefited and thrilled when he visits the 1935 Machine Tool Show.

Training Skilled Men

CHESTER H. FRANKLIN

If anyone doubts that training men or boys for the shop is a real problem, a study of the comments on the article which appeared (*AM*—Vol. 78, page 794) would soon dispel the illusion. Ideas vary widely, depending both on the age and previous training of the individual, and the kind of training desired.

One skilled mechanic both of the old school and the old country is positive that no technical graduate is worth his salt and none of the apprentice training here, even in the best shops, makes mechanics who are of any use outside of production shops. Another feels that shop training tends to produce operators only, regardless of how expert they become. This commentator feels that the well-trained trade school boy has a great advantage.

A third points out that we do not appreciate the extent to which the highly skilled man saves money in the cost of supervision, and that this factor is not considered in setting his rate of pay. This type of man, when in charge of intricate machinery, (whether automatic or not), makes it possible for comparatively unskilled men to produce large quantities of accurate work. And in too many cases, the operator, because he is looked upon as the producer, receives the higher wage. The skilled man who made the output of the machine possible may even be classed as a non-producer, in some systems of accounting.

These varying views, coupled with the very evident need for more skilled men, make the whole subject one that needs very careful consideration.

Apprentices in the Small Shop

A. W. FORBES

In the small shop it is possible to see the work from the beginning to the end. The apprentice sees the orders as they first come into the shop. Often he meets the customer and sees the order placed. While his own work on this order may be but a very small part, he does it as a part of the finished job, and understands just where his own part fits into the whole.

Since the work is not so much standardized, the new job often differs from anything that has been done in the shop before. The manager consults with the machinists as to how to design the part and the tools needed before the work starts. After it is in process new questions come up that have been overlooked. In all of this the apprentice makes contact, and soon has a part.

Much of the engineering work is done in the shop. The work of a draftsman is usually only to record what he has been told or to handle unimportant details. The manager, in consultation with the foreman and the workers, determines the actual design, and a busy manager will not spend the time himself to work out the details if he has a machinist to whom he can say, "Make this to suit the customer, and then give me a sketch of what you did for our records."

While the equipment of the small plant may not equal that of the large, in some cases it may be superior, and whether it is or not, there is always the problem of improvement. In the small plant the question of improved methods starts in the plant, with the men who are doing the work, and the apprentice soon takes part in it.

Possibly the greatest advantage of all is that the apprentice is in direct contact with the head of the company, with the one who is primarily interested in seeing that he advances to as high a position as he is capable.

QUIETER GEARS for BUICK

Starting with the desired finished product Buick gear engineers worked back through each operation to secure a carefully controlled production line

Fig. 1—Finish reaming bores in the Buick transmission case is performed in one set-up with multiple tooling

UNIFORMITY in the accurate manufacture of transmission gears has been increasingly important in recent years, particularly as the result of public demand for greater quietness. Difficulties in obtaining satisfactory gears center largely around the final operations, including finishing before heat-treatment, heat-treatment itself, lapping and assembly into the case.

The most accurately machined gears may be entirely unsatisfactory if errors be introduced in assembly into the case. If variations between gears or changes to inaccurate shapes are introduced in heat-treatment, or if the always unavoidable changes occurring during the heat-treatment are not accurately controlled and compensated for before and after heat-treatment, wear and noise result.

The Buick Motor Company solved these various problems, when it recently set up its own production line for the manufacture of transmission gears. Instead of setting up production methods and equipment that could be expected to turn a bar of steel into a finished gear, the gear itself was the starting point. Step by step, in reverse order, were determined the type of equipment and tooling, the production processes, desired tolerances for each stage and part, through heat-treatment, finishing, gear cutting, turning, and forging until the steel bar was reached.

Even here, however, control did not stop, for by means of the reverse layout method pursued, the desired characteristics for the steel itself were determinable and specifications established for close control of grain size, fiber structure, etc.

As a result, the equipment and methods used in the manufacture of Buick transmission gears are probably among, if not the most, modern and consistent in industry. The equipment itself, of course, had to be the most reliably consistent available, since each stage in the production of the gears had to be closely controlled for uniformity. Even the forgings are held to close limits, so that variations in the final product would not be introduced by differences in the amount of stock removed.

Accuracy in the Case

The manufacture of Buick transmission gears, therefore, can be said to start with the assembly of the gears into the case, and here it should be noted that all the bores of the case are line-reamed simultaneously on a multiple line-reamer, Fig. 1. This assures maximum accuracy as to relative location of gear centers and proper relationship of the gears to each other. Without this the most accurate ma-

Fig. 2—Counterboring protects the centers and insures accurate work location during the machining operations

chining of the gears would be wasted.

Naturally, the value of such a set-up requires that the gear and shaft assemblies in turn be absolutely concentric. Therefore, through all manufacturing operations, gears and shafts are located from fixed centers. This in turn requires that the first operation following forging must be a true centering of the blank, locating from the O.D. of the gear blank. Furthermore, the center has to be of such a character that recentering is not required. Fig. 2 shows a group of transmission gear blanks after centering. Note that in addition to the conical "center" in the drive gear, the hole is also cylindrically countersunk. This section extends to the cut-off point, so that end trimming of the piece can be done on centers. The centers themselves are sunk to exact depth, to control lengthwise turning and facing dimensions.

Broached Bores

In the hollow gears, including countershaft cluster, second speed and idler gear, the holes are first pierced—piercing being used to assure a uniform and close grain structure in the bore. After piercing, the bores are finished by broaching. For the cluster gear, for instance, there are three broaching operations, rough, semi-finish and finish. The broach cutters incidentally, have splines to cut 0.002 in. deep grooves in the hole to keep the bushing from turning after assembly.

In the idler gear, three keyways, 120 deg. apart, are cut in the bore for driving purposes, instead of the usual single keyway. This is done to assure uniform structure and prevent distortion during heat-treat by equalizing metal distribution.

Lapped After Heat-Treatment

The final operation on the gear tooth is a lap following heat-treat. The Michigan Tool equipment used for this is shown in Fig. 3. Each operator takes care of three of these machines. In this operation, the gear is mounted on a driving arbor, or on driving centers, as the case may be, as if it were assembled in the transmission. The gear itself drives the three radially disposed cast iron laps, while the gear moves back and forth axially.

It was found desirable to use the minimum number of strokes possible for lapping, and average lapping time per gear in fact is only two minutes. The number of strokes or revolutions

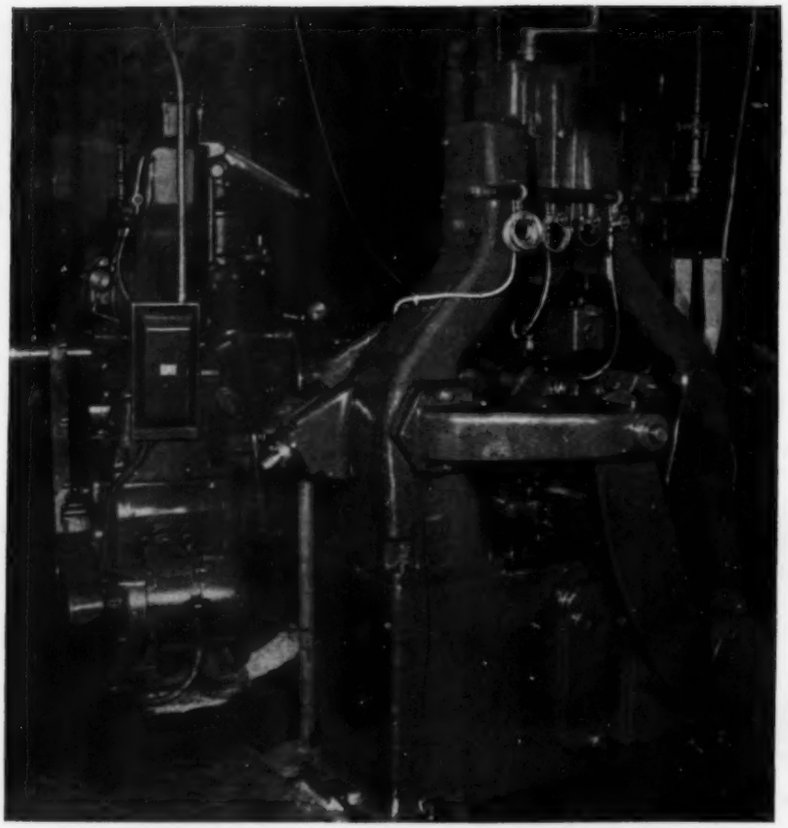


Fig. 3—Small inaccuracies resulting from heat-treatment are corrected by a lapping operation which gives the gear teeth a polished surface

of these lappers are therefore fairly well fixed, and the amount of lapping action required, if variations are encountered, is varied hydraulically by regulating the pressure of the laps on the gears.

It will be realized, of course, that it is essential that gears be clean when they reach the lap and must have no scale. To make this possible, Buick Motor Company developed an interesting heat-treatment cycle. Gears are hardened in cyanide baths, although they are not "cyanided." The hardening baths are similar in arrangement to an automatic plating installation, an automatic conveyor being loaded with a fixed charge (as to weight) of gears, and dipping in turn into pre-heating, maximum temperature, and quenching temperature cyanide baths, and also into the quench itself.

Shallow Case Helps Lapping

Following this operation, gears go through a vertical automatic drawing oven. Gears coming out of this heat-treat are clean with no trace of scale. The cyanide produces a case hardening effect, of course, but this is only 0.002 to 0.003 in. deep and works well with the simple final lapping operation.

All steels, of course, "distort" or "grow" during heat-treatment, but with this close control, the change is closely regulated and standardized and is compensated for prior to heat-treatment in the gear shaving operation.

This latter operation, shown in Fig. 4, is probably the key to Buick's entire gear machining set-up, being performed on specialized Michigan Tool gear finishing equipment. This equipment not only compensates for heat-treat changes, but also controls, the manufacturing set-up prior to shaving.

Production Shaving

Here again the gears are mounted on arbors to duplicate their position in the transmission, and are allowed to roll back and forth on a reciprocating cutting rack, which "shaves" the gear teeth to the desired form. There are separate machines and racks of course, for the various gears on the countershaft cluster.

Buick gets about 25,000 to 30,000 gears per resharpening of the rack. The use of the gear shaver makes it

possible to hob the gears in one operation, separate roughing and finishing cuts not being required except on the center (low speed) gear of the countershaft cluster. The latter is a fairly wide gear having a high (25 deg.) pressure angle and a 20 deg. helix, and is both rough and finish hobbed.

It was found that the tolerance variations permissible by the use of gear shavers following hobbing, made it possible to get just as many gears per hob resharpen as if rough and finish operations were used. Furthermore, with the gear shavers in the line, Class B ground hobs were found quite satisfactory, thereby reducing hob costs by roughly 20 per cent. It might be mentioned here, though, that every time there is a machine or hob change, or hob-reset, gears are routed through one of the best equipped gear checking laboratories to be found, for complete checking of tooth form. The type of equipment used is illustrated in Fig. 5.

Fig. 5—A constant check is maintained at Buick by a finely equipped "gear laboratory"

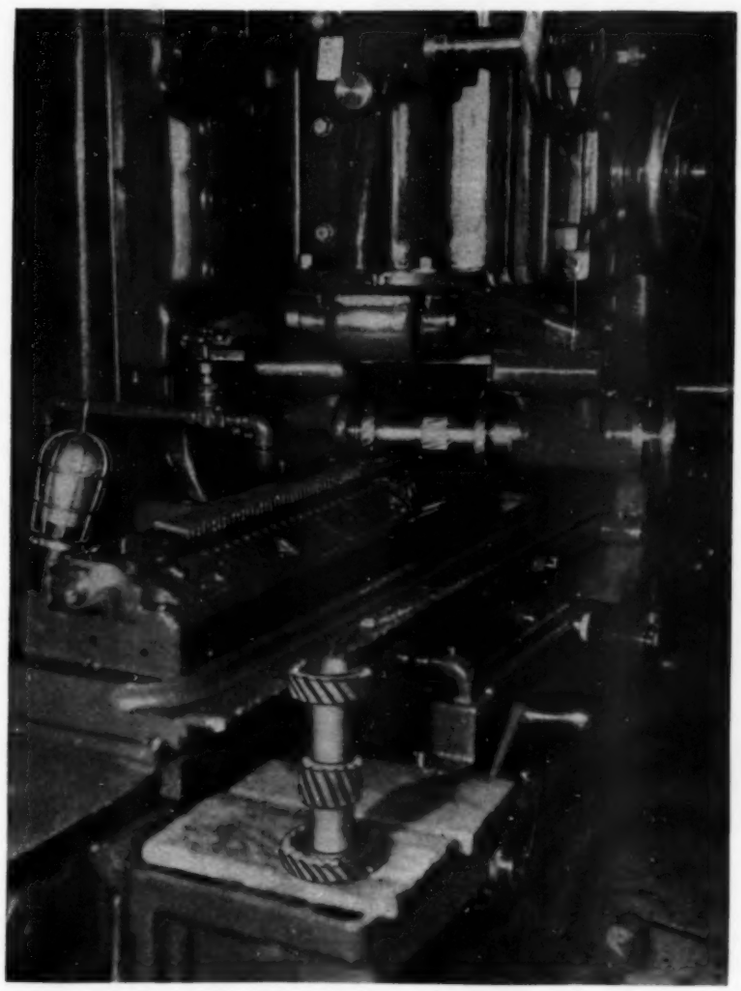


Fig. 4—Tooth shaving is the last operation before heat-treatment; the table with the rack shaped cutter reciprocates while the gear rolls over it

In hobbing, gears are of course also located from centers. Low speed and reverse gears are hobbed in pairs, back to back, virtually doubling productivity (Fig. 6). While the idler gear also has a 25 deg. pressure angle and 20 deg. helix angle, the comparatively narrower face makes it permissible to finish hob this gear in one operation.

Recentering Not Needed

Machining operations prior to hobbing are designed to make recentering unnecessary, except as a safeguard. Major operations might be cited, as an example, for the drive gear, which requires the closest control of all transmission gears, since any errors will multiply themselves in the transmission assembly through the gear train.

After centering, the blanks are rough and finish turned separately on automatic lathes with multiple tooling, the blank being mounted on centers and driven with a self-centering chuck. Finishing of the rear gear face, cutting to length and semi-finishing of bearing diameters, etc., is subsequently performed on Bullard automatics, to eliminate error due to rechucking, etc.

On the drive gear, there is a re-centering operation after this, which is in the form of a chamfer in the drilled ends of the piece, to correct for any errors introduced possibly by the machine itself.

The same operation on the hollow gears is performed with the gears driven onto 0.001 in. tight fit arbors

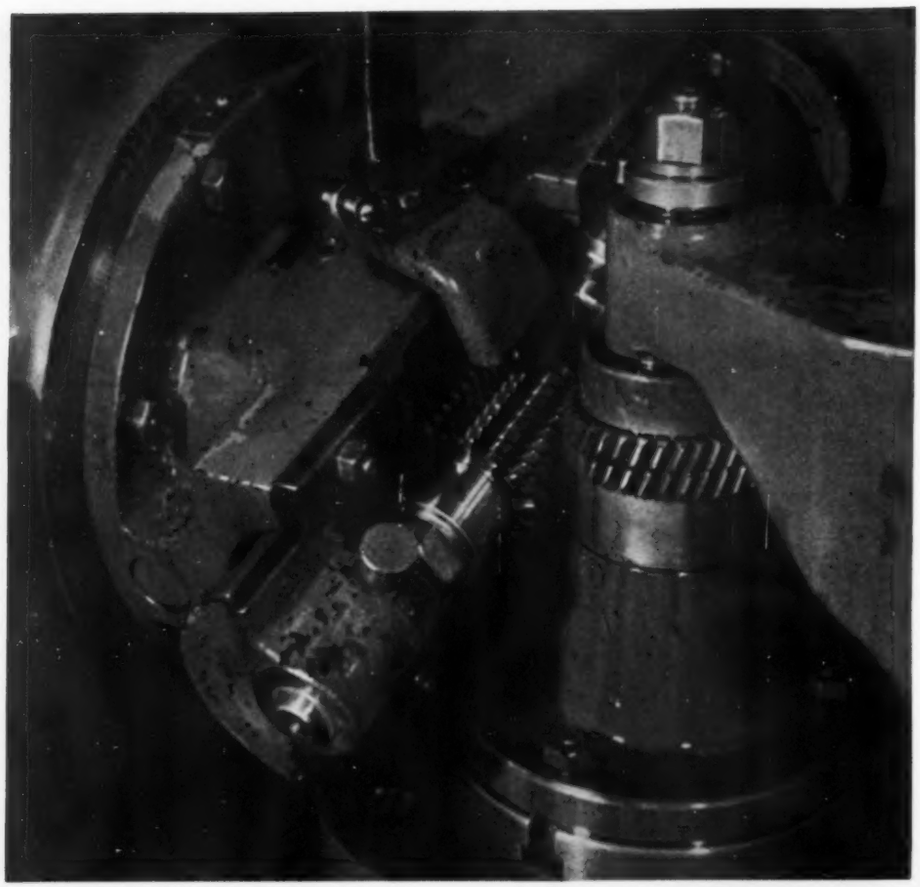


Fig. 6, left—Two low speed gears are hobbed back to back at one time

Fig. 7, below—Accurate gear teeth would be useless without accurate bores. Here is shown the idler gear being diamond bored

forming part of the machine fixtures. Other turning operations, on lathes, are performed by locating and driving with expanding centers in the bores.

Oil holes are drilled following finish turning, and here it is to be noted that such holes are drilled adjacent to the gear cylinders, rather than through them. In this manner drilled holes through gear teeth are avoided. These might cause tooth distortion in heat-treatment, otherwise.

Threads on the drive gear are cut on thread millers, using driving centers for accurate locating, again.

Other interesting gear operations include the cutting of internal grooves in the cluster gear to prevent bushing slip; cutting of internal clutch tooth with a helical load on gear shapers, locating from the face of the gear blank (which is true with the far center) broaching of internal involute splines; and the cutting of shifter fork grooves on lathes with carboloy tools.

Clutch splines on the drive gear are hobbed on a group of the latest Cleveland Rigidhobs. Following, heat-treat, bores and bearing seats are finished by grinding, the former of course, with an internal grinder, but locating from the gear pitch line diameter. The bore of the second speed gear is honed for maximum accuracy. After assembly of bushings in the cluster and idler gears, these bushings are diamond bored as in Fig. 7.

Gear blanks after upset forging are all annealed, normalized and pickled.

The manufacturing process built around this equipment has resulted in highly accurate and uniform gears. Contributing to this is that the process makes possible a minimum of stock removal, eliminating distortion.

EDITORIALS

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McGRAW-HILL PUBLISHING COMPANY, INC.

K. H. CONDIT • F. H. COLVIN
EDITORS

PREPARING TO PAY

SOME remnants of fiscal sanity seem to have been retained in Congress even though as much cannot be said of the source of the latest federal taxation proposal. At any rate enough members balked at having this latest New Deal "equalization" experiment r a m m e d down their throats to prevent its attachment as an amendment to the nuisance tax extension resolution.

No one, least of all the Administration, has any clear idea what this proposal would produce in the way of revenue. Business and financial leaders have been so taken aback by its suddenness that they have not as yet discovered how much it will hurt business. Investors in the stocks of the big substantial corporations whose equities have been considered better than many bonds have not had time to figure out what is going to happen to them nor to decide whether to switch their holdings to other forms of domestic investment or to expatriate them.

We have all known for two years—or at least we have been warned by such clear thinkers as Lewis Douglas —that crushing taxes would be imposed sooner or later to pay for the Roosevelt ian experiments. We should have been preparing to pay for them. Now we get the first sharp warning of what is in store. This one is a discriminatory tax, others will hit everyone.

Most of us have been so hard hit by the depression that graduated super taxes on the big incomes are of purely academic interest. We are likewise cynical enough to believe that the wealthy few will find a way to escape unreasonable taxes, just as they always have. Our income tax laws have ever been remarkable for their loopholes.

But most of us are still practical enough to believe that the purpose of taxation is to raise money to liquidate a national debt burden that is near the danger point. When we are offered a proposal like this one, which is too evidently a punitive attack on certain individuals and corporations, and indirectly on their stockholders, we cannot but have serious doubts of those who sponsor it, and of their motives.

Congress should take plenty of time to put this tax plan through the full legislative procedure to make sure what it means, what revenue it will raise, what harm it may do. Only after that is done should it be brought to a vote. In the meantime we can all prepare to pay as best we can.

Fellow, A.S.M.E.

THOSE members of the American Society of Mechanical Engineers who were fortunate enough to serve on the Committee on Awards when good old Dr. Hollis was chairman will never forget his indignation at the design for the 50th Anniversary Medal which showed the engineer in the Greek manner, without his overalls. It took the full membership of the committee with some outside help to convince him that art was often symbolic rather than literal. The same feeling may possibly rise up in the breasts of present members when they are asked to vote on the change in member grading which establishes the new rank of Fellow.

Fellows have generally been looked upon as scholars who lurk in the cool academic shades or bask in the light of scientific gatherings when their fundamental discoveries are announced to a waiting world. The engineer, on the contrary, has usually considered it his job to turn these matters to practical use for his fellow citizens, without too much fanfare and shouting and bestowal of honors.

But other engineering societies have led the way and have found a certain degree of satisfaction and prestige in dignifying their more prominent members by calling them Fellows. Undoubtedly the Mechanical Engineers will have much the same experience. Why not claim a little more credit for their services to humanity and honor the leaders who have done the work?

Chips

Washington—Roosevelt joins "share-the-wealth" movement by proposing inheritance and gift taxes, higher taxes on large incomes, graduated corporation taxes; demands immediate action . . . Senate shows lack of enthusiasm . . . Passes Security Bill as House passes Wagner Bill and both measures go to conference . . . Ousted Assistant Secretary of Commerce unable to substantiate sensational charges of maladministration at Senate investigation . . . Navy Appropriation Bill carrying funds for 24 ships and 550 airplanes goes to the White House . . . TVA officials and lawyers not so cocky in appealing Judge Grubb's decision that they have no right to sell power . . . Senator Norris fights to end 5–4 Supreme Court decisions . . . Representative Dies organizing support for his bill to deport 7,000,000 aliens to solve unemployment problem, claims it would be reciprocal with corresponding measures in force in Europe . . . NRA and FTC officials discuss problems and advise industry against haste in offering permissive codes . . . Roosevelt allocates $50,000,000 in relief funds to establish project aiming at training, education and employment of those between 16 and 25, Aubrey Williams and Miss Roche in charge . . . House kills utility "death sentence," 216-146.

Foreign—British and German television firms acquire rights for use of Farnsworth (American) method in their respective countries . . . French still displeased at German-British naval agreement . . . Germans willing to restrict use of submarines . . . British invite Russians to naval discussion . . . Citroen company is reorganized with smaller capital and preferred liens on profits for the creditors . . . Goebbels draws distinction between intellectuals and intelligent as Nazis hunt for men with brains to fill difficult posts . . . China tattoos drug addicts who take cure and promises to shoot backsliders . . . German unemployment drops to 2,230,000 . . . Goering, formerly lenient, comes out strongly for anti-Semitism . . . Schacht extends moratorium for another year in Germany . . . Mussolini expected to open hostilities against Abyssinia in the fall.

Finance—Temporary deposit insurance regulations are extended for one or two years, depending on whether the Senate or House view prevails in conference . . . Treasury offers another $100,000,000 in bonds . . . U. S. to pay Panama Canal annuities in gold after long negotiations.

Industry—General strike threatened in Ohio by Columbus (Ohio) Labor Federation in effort to force settlement of meat cutters' strike . . . Two killed in South Carolina textile strike . . . Omaha street railway strike ends after two die . . . International Labor Office votes for 40-hour week in some industries and plans meeting in Chile . . . Norfolk Navy Yard order for $56,000 worth of cranes goes to Shepard Niles . . . Stockholders vote merger of Pratt & Whitney Aircraft, Chance-Vought and Hamilton Standard Propeller units with Sikorsky Aircraft Corporation . . . Two new railroad pension bills are introduced . . . Navy asks bids on 13 ships. . . . Coal strike postponed only at last moment because White House was not informed.

Trade—League of Nations annual review for 1934 puts U. S. at top of exporting nations and third in imports, back of Germany . . . Japan remains seventh in exports, Great Britain second in both exports and imports.

Indicators—Steel production slips a little lower . . . Electric power output reaches highest level since November, 1929 . . . *Business Week's* index down to 63 in seasonal slump.

Congress Sees in Tax Program A Potential Political Issue

WASHINGTON—"Soak the Rich" and "Share the Wealth," slogans popularized by the tireless efforts of those prophets of the proletariat, Huey Long and Father Coughlin, have become administration policy through President Roosevelt's tax message. The chagrin of these trial balloonists at having their pet programs appropriated would be amusing were it not for the more serious implications of the proposal.

The taxing power, always the most formidable weapon of any government, is to be fully used to bring about the New Deal's social objectives (*AM*—Vol. 79, page 432c), toward which other pathways proved abortive. The President proposes to extend the use of surtaxes, to impose drastic inheritance and gift taxes and to invoke a new principle of graduated corporation taxes. This latter expedient is, of course, a continuation of the attack on bigness, contained in NRA and in the pending holding company legislation.

The President denied having requested Congress to pass his three tax recommendations before last Saturday but did state at a press conference that he desired passage before adjournment. He disclaimed authorship or knowledge of the rate schedule by which inheritance taxes would be levied to 75 per cent, individual surtaxes to 80 per cent and corporation income tax would range from 10 to 17½ per cent. He did, however, inform a wealthy Western caller that, when his program was all through, there would be no fortunes in excess of $7,000,000, and no incomes over $60,000 a year.

The Brighter Side

From the standpoint of the durable goods industries, there may be a silver lining to this otherwise ominous cloud. The heavy corporate taxes during wartime resulted in a "plowing under" of profits in improved production and sales facilities. It is likely that the higher corporate tax scale now proposed may have the same result—companies spending for the future when they hope the dark cloud will blow over.

Congress, which now seems destined to remain in its air-conditioned chambers all of July and perhaps a good part of August, has also received a Presidential request to pass legislation to prevent future gold clause suits against the government by holders of over $10,000,000,000 worth of Treasury bonds and notes outstanding. Based on the increased buying power of the dollar, the Supreme Court ruled that previous claimants had not in fact suffered a loss. But an increase in prices to 1929 levels might give these claims a new complexion. Besides, some observers say that the President may wish to devalue the dollar further before his present delegated authority to do so expires.

At this writing the social security measures and the Wagner labor relations bill are still in conference. These measures, together with the utility bill, are widely believed to be unconstitutional. One theory is that the Felix Frankfurter tactical school has no objection to the passage of bills of doubtful constitutionality if it can put the Supreme Court on the spot and so pave the way for an amendment that will effectively clip the wings of that august body.

Another "Must"

Another bill in the "must" group is the banking measure. Apparently the administration is convinced that, by loosening credit, the proposed power will constitute one of the chief instrumentalities for fighting the depression. If the bill is not passed at this session there will be no opportunity to show what it can accomplish before the election in 1936.

Right now it seems that most of the measures in the "must" list will be passed. Congress has little real enthusiasm for many of them, but in general the legislators have no disposition to offer real resistance. The alacrity with which they took up the President's tax suggestions shows that they believe here is something they can make into an "issue." With their constituents listening to the Long-Coughlin siren songs they can go back home and point out that they, too, are aboard the "more abundant life" bandwagon.

Big Blower—**Boulder dam generators have a blower at each end, 286½ in. in diameter, fabricated from ⅜-in. steel plate. Here is one of the rotors being bored at the Westinghouse plant in East Pittsburgh**

Amtorg Places Orders With American Builders

The Amtorg Trading Corp., purchasing agent of the U.S.S.R. in the United States, has announced that on Thursday, June 27, it placed orders totaling $3,000,000 for American machine tools to be installed in the Moscow and Gorki automobile plants. The announcement goes on to say that the orders were placed with the following companies: Cincinnati Milling Machine & Cincinnati Grinders, Inc., Landis Tool Co., Fellows Gear Shaper Co., Bryant Chucking Grinders Co., National Automatic Tool Co., Oilgear Company, Gould & Eberhardt, Barnes Drill Co., VanNorman Machine Tool Co., Chambersburg Engineering Co., Osborn Manufacturing Co., Leeds & Northrup Co., National Machinery Co.

Printing Equipment Men Have Used-Machinery Plan

The question of how to handle used machinery which has no present value for economic production may be solved in one industry by the plan proposed before the National Printing Equipment Association. Under this plan, machinery that should be retired because of wear or obsolescence would be purchased by a "clearing corporation" and turned into scrap. The corporation would pay for the machines with "certificates of value" to be redeemed on sales of new machinery and equipment. The plan received unanimous approval and will be explored further.

W. L. Batt Wins A.S.M.E. Nomination
Society Discusses Membership Grades

CINCINNATI—At the Cincinnati Spring Meeting of the American Society of Mechanical Engineers, held June 19-21, a business session advanced the proposal for a change in membership grades one step nearer to adoption. It received the report of the Constitution and By-Laws Committee and made certain minor changes. The report will be submitted to letter ballot later.

The Nominating Committee, headed by Prof. A. G. Christie of Johns-Hopkins University, presented a slate headed by William L. Batt, president, SKF Industries, Inc., Philadelphia. The slate is printed in the next column. The letter ballot to which this slate will be submitted closes September 24.

New Gradings

Under the new grading of membership the engineer will be carried through from his student days up to advanced standing in his profession as student member, junior, member and fellow. In addition provision is made for associates and honorary members. The principal change, of course, is the establishment of the grade of Fellow which is in accord with the recommendations of the Engineers' Committee for Professional Development. Such a grade has existed for some time in the American Institute of Electrical Engineers. Eligibility for the fellow grade involves 25 years of active practice and 13 years in the member grade. Provision is made for election of fellows by unanimous vote of Council when the specified length of service in the member grade is lacking. The minimum age limit for members has been dropped from 32 to 30, and the period of practice from 10 years to 9. It is specified that candidates for president and vice-president shall be of the fellow grade.

This report is the recommendation of the Committees on Membership and on Policies and Budget, and has been reviewed by the Committee on Constitution and By-Laws.

At the dinner on Thursday evening the Holley Medal was presented to Dr. Irving Langmuir, General Electric Co., by President Ralph E. Flanders, on recommendation of Mr. Batt, chairman of the Committee on Awards. The citation was delivered by Dr. Harvey N. Davis, president, Stevens, Institute of Technology. In responding to the presentation Dr. Langmuir delivered an address on The Mechanical Properties of Matter. He remarked that the discovery, during the last two years, of three new subdivisions of the atom would certainly have a profound effect on our knowledge of the properties of matter. In this connection Dr. Langmuir maintained that the engineer is not nearly as well acquainted as he should be with modern physics and that he should take steps to acquire this knowledge. He also complained of the tendency of physicists to concentrate on this new and fertile field of atomic structure to the virtual exclusion of the various properties of matter of which we know so little.

Attendance at the machine shop practice sessions was good and discussion was vigorous especially of Prof. O. W. Boston's (University of Michigan) paper on cutting fluids and their influence on tool life. Sol Einstein, Cincinati Milling Machine Co., presented an interesting comparison of the problems facing the machine tool designer today with those of his predecessors of a generation ago. He laid particular emphasis on the accuracy demanded of production tools today which is far beyond anything dreamed of in the toolroom of 30 years ago. During the discussion of the paper by Alexander Sellers, Jr., (*AM*—Vol. 79, page 458) K. H. Condit, editor, *American Machinist*, made the suggestion that the railroads consider adopting the five-year plan of progressive equipment replacement which has been tried out in the Navy and by the Westinghouse Electric & Mfg. Co.

Cincinnati machine tool builders and their engineers were much in evidence at the technical and social sessions, and their contributions to both went far to make the meeting a successful one. It was announced at the meeting that the invitation of the Dallas, Texas, section to hold the 1936 gathering in that city had been accepted by the Society.

Presidential Nominee

W. L. BATT
President, SKF Industries, Inc.

Vice-Presidents

A. D. BAILEY
Superintendent, Generating Stations, Commonwealth Edison Company.

J. A. HUNTER
Professor, University of Colorado.

R. L. SACKETT
Dean, Pennsylvania State College.

W. A. SHOUDY
Orrok, Myers & Shoudy, Construction Engineers.

Managers

W. L. DUDLEY
Vice-President, Western Blower Company.

W. C. LINDEMANN
Secretary, A. J. Lindemann & Hoverson Company.

J. W. PARKER
Chief Engineer, Detroit Edison Company.

May Foundry Orders Show Seasonal Let-Down

Net orders for foundry equipment in May dropped to an index of 100.7 from a figure of 113.0 in April. May business was appreciably above the same month last year when the index stood at 66.5. Unfilled orders for May were at 117.7 as contrasted with 86.1 in April and 52.1 in May a year ago. A considerable rise took place in the three-months' average of gross orders, the figures being 94.4 in May as against 86.0 in April and 69.9 in May, 1934. Shipments dropped slightly, the index for May being 67.0, for April 69.7 and for May last year, 75.6. These figures were compiled from twenty-two reports to the Foundry Equipment Manufacturers Association, and are based on the average of 1922-24 as 100 per cent.

Metals-Plastics Exhibit Will Open in New York

A permanent exhibit of metals and plastics will be opened on Sept. 1 at Rockefeller Center, New York, N. Y., by Metal Products Exhibits, Inc. The exhibition will feature ferrous and non-ferrous metals, plastics, finished and semi-finished parts made from these materials, finishes for metals and plastics, manufacturing processes, designs and styling. Visitors will be able to examine the materials and to get full data concerning properties, applications and sources of supply. Herbert R. Simonds, is vice-president and general manager.

Auto Makers Take Standard Machines; June Output Holds, July to Be Off

DETROIT—A large order for standard machines—lathes and shapers—was closed in the last few days for one of the large producers. This has been the first sizable order for strictly standard machines in some time. Similar business of this nature is expected to close shortly. As previously reported the car builders are now willing to consider investment in equipment if a better product results at the same cost. Therefore, optimism continues in the machine tool business and inquiries are at a high level. Closings are reported good but no large programs are in evidence at present.

June auto production is expected to equal the May figure of 385,500 units. Several companies slackened their rates during the month but Chevrolet was operating at nearly the maximum output and thus maintained the overall figures. Tapering production can be expected for the Summer months. July will show a decrease from June, and during August and September the change-over to the 1936 models will be in progress. October will show increasing volume to stock dealers in preparation for the November showings.

The upturn in sales reported at the end of May carried over into June. Dodge dealer sales the week ending June 15 exceeded the previous week by 4.4 per cent. Plymouth deliveries were up 4.2 per cent for the same period and Hudson-Terraplane reported 200 more car sales in this week than the week previous. Packard, Olds, Pontiac and Chevrolet report similar trends.

May sales are estimated at 309,900. General Motors sales to consumers in this country were 109,051 as compared with April sales of 143,909. Financing of new passenger cars decreased 6.8 per cent in May as compared with April, while exports in April were 11 per cent under the March figure. The used-car inventory is lower because of the recent 10 per cent slash in prices.

Tool Shops on Upgrade

Barring the two or three summer introductions, engineering work will be about complete by the middle of July. Castings for the larger body dies are mostly completed at the present time, and there has been a reduction in pattern making forces in several of the larger shops. Although all tooling programs are not fully under way as yet, employment and business in independent tool shops is one the upgrade with activity becoming fairly general among large and small shops.

Independent engineers are busy in developing the diesel for passenger cars. One large maker is reported carefully checking the performance of a German rear-powered car and another is developing a V-eight, but the 1936 changes appear to be minor refinements of present models.

The Evansville plant acquired by Plymouth will be devoted to assembly operations only, parts being shipped from Detroit as in the case with the California plant. Expectations that this development would result in extensive equipment installations are not to be realized, nor will equipment be shipped from Detroit and replaced with new. Assembly fixtures and material handling conveyors will of course be needed. Operations are expected to begin in the fall, probably with the initiation of the new model. Bodies will be built by Briggs in the former Graham plant in the same city. In April a battery of diamond boring machines was installed in the Detroit Plymouth plant, resulting in greater output in less space and a reduction in machining limits.

The most recent expansion of facilities in the industry is a new foundry for the Kelsey-Hayes Wheel Corp. with a capacity of 250 tons daily. Plant and equipment are to be ready for operations in August. Cast hubs and drums are to be produced in this plant to provide for the increase in castings used for these parts. Considerable savings are anticipated through conversion of scrap rather than sale at scrap prices as was formerly done. The Ford strip plant is nearing completion and the glass plant is expected to be in operation by the first of the year. Installation of the large presses at the Rouge plant for stamping the floor of the body in one stroke will be completed by July 15.

Industrial Review

• Two relatively new factors are affecting the sales of machine tools at the present time. One is the increasingly serious shortage of high grade machinists, which is delaying deliveries, and the other is the announcement of price rises in several lines, which has resulted in pushing through a fair amount of business. The labor shortage is also worrying manufacturers of other types of light machinery. To counteract it many companies are reviving or inaugurating apprentice training systems, and others are setting up schools for breaking in learners where the pressure prohibits the possibility of waiting for fully trained machinists.

• Most manufacturers in New England are about as busy as they can comfortably be with the existing supply of skilled help. Orders have dropped off a little lately. New York reports continued activity in the metropolitan district with encouraging inquiries being received. In Philadelphia orders are coming in with fair regularity although inquiries are off. Fair is also the term applied to business by Pittsburgh distributors.

• Cleveland reports an active June with much of the machine tool business coming from customers who must have new equipment if they are to operate at a profit. July and August are expected to be somewhat less active. In Detroit the continued activity of the automobile plants has attracted men who had drifted away in search of steadier employment and there is consequently no particular difficulty in getting men as they are needed. Inquiries for machine tools are increasing and occasional small orders are being booked. Toledo reports a sudden and considerable pick up in orders during the past fortnight.

• Although June business in Cincinnati was not generally up to the May level several plants there are working at close to their capacity with existing forces. Chicago reports excellent orders during the last half of June and looks for more unless the recent tax threat in Washington scares off the customers. Both orders and inquiries are holding up well in Milwaukee and active steps are being taken to train both apprentices and learners. Some of the old men are beginning to drift back, as is the case in other centers. Both inquiries and orders are more spasmodic in St. Louis. Skilled workmen are not hard to find but the standard of skill is distinctly lower than it was five years ago.

MAPI Elects Officers; Discusses Problems

At the second annual meeting of the Machinery and Allied Products Institute, held at the Statler Hotel, Cleveland, June 26, most of the members of the executive committee were re-elected. The committee is now made up as follows: Harry C. Beaver, Charles E. Brinley, P. C. Brooks, Phillip Dennett, William C. Dickerman, Maurice F. Dunne, Robert M. Gaylord, Leo. W. Geothaus, George H. Houston, Philip M. Morgan, D. F. O'Brien, W. S. Shipley, Harold C. Smith, George P. Torrence and George A. Wainwright. These officers for the ensuing year were elected by the executive committee: President, John W. O'Leary; vice-President, N. W. Pickering; treasurer, Robert E. Friend; secretary, Paul C. DeWolf; assistant secretary, Alexander Konkle.

The keynote address was delivered by Charles E. Brinley, president, American Pulley Company, who urged continued and complete unification of the machinery industries. This plea was supported by Harry C. Beaver, president, Worthington Pump & Machinery Corp., and Harold C. Smith, president, Illinois Tool Works. President O'Leary reported on the activities of the Institute during the year. Malcolm Muir, president, McGraw-Hill Publishing Company, Inc., spoke informally on legislative trends, and George T. Buckingham, MAPI counsel, outlined the legal problems facing the industry.

Foreign Conditions Discussed

At luncheon William C. Dickerman, president, American Locomotive Company, presided and spoke briefly on foreign trade prospects. He then introduced Kenneth H. Condit, editor, *American Machinist*, and Alexander M. Hamilton, vice-president, American Locomotive Company, who spoke respectively on German and Russian conditions. In the afternoon Charles F. Stillwell, vice-president, Warner & Swasey Company, and president, the National Machine Tool Builders' Association, read an inspiring paper on buying and selling methods in the machinery industry.

Philip M. Morgan, treasurer, Morgan Construction Company, presented the report of the Advisory Committee whose function is to initiate new objectives to be considered by the Executive Committee. He was followed by Robert M. Gaylord, president, Ingersoll Milling Machine Company, who offered the revised budget.

A. H. TUECHTER

A. H. Tuechter Deals Squarely for 50 Years

Fifty years ago, on July 13, 1885, August H. Tuechter—"Gus" to his host of friends—started in the machine tool business in the old shop of H. Bickford, on the Cincinnati river front. This shop was then eleven years old, having started in 1874 to make upright drilling machines. Shortly after 1885 Bickford left Cincinnati and went to Lake Village, N. H., later called Lakeport, where he built boring mills for many years, but this shop is now among the missing.

After Bickford's departure the business was reorganized by Charles Hoefinghoff, Anton Mill and A. H. Tuechter. Mill was the designer and engineer and he and Tuechter were junior partners. The firm then became the Bickford Drill Co. This continued until Lewis G. Keck, a son-in-law of Hoefinghoff, joined the firm which then became the Bickford Drill & Tool Co.

At the death of Charles Hoefinghoff, his son Harry became head of the company. Tuechter left the company at this time and with Sherman C. Schauer, who had been connected with the Hamilton Machine Tool Co., formed the Cincinnati Machine Tool Co. to build upright drills. About this time Mill severed his connection with Bickford and was succeeded by H. M. Norris. D. C. Klausmeyer was then a boy in the drawing room.

The old shop occupied by the newly formed Cincinnati Machine Tool Co. was bought from A. H. Kerkhoff who was one of the men with Bickford in the early days, and had been its superintendent. He and his brother George started to build upright drills but failed and the shop was taken over by Tuechter and Schauer. This shop was at Western Avenue and Dayton Street, but later gave way to a new and modern shop for those days, at Spring Grove Avenue and Township Street.

After the death of Harry Hoefinghoff the Cincinnati Machine Tool Co. bought the Bickford business and the name became the Cincinnati-Bickford Tool Co., as it is now known. Norris became the engineer of the combined company, which later built the present plant in Oakley.

Those who have followed the developments of the Cincinnati-Bickford drills, both upright and radial, know that they have been the logical outcome of the half century that Gus Tuechter has devoted to building a single line of machines. His painstaking efforts have won him notable achievement in machine tool development and in addition an enviable reputation among friends, customers and competitiors alike of being absolutely square in fifty years of business dealings.

Two Drill Company Men Have Served 55 Years

That old crack about the "first hundred years are the hardest" has not daunted two employees of the Cleveland Twist Drill Company. Both of these men have served the company for 55 years each and are still actively engaged. The employees in question are F. F. Prentiss, chairman of the board, and R. D. Boltey, senior Cleveland salesman. Mr. Prentiss became a partner of J. D. Cox in 1880, and the firm of Cox & Prentiss manufactured milling machines, planers and twist drills. From a small business employing twelve men it grew until today it employs more than 500 people. Mr. Prentiss served successively as superintendent, manager, vice-president, president, and now chairman of the board.

Mr. Boltey was born literally in a cemetery. (His father was the sexton). He joined the small organization of the Cleveland Twist Drill Company at the ago of eleven and was put to work brushing the flutes on drills. At fifteen he was head of the bit stock department and progressed from one department to another until he covered

every operation in the factory. In 1905 he joined the sales department where he has been ever since.

E. B. Meyer Is New Head of Electrical Engineers

E. B. Meyer, chief engineer of the Public Service Electric & Gas Company, was elected president of the American Institute of Electrical Engineers at the annual convention held at Ithaca, N. Y., June 24-28. Other officers elected were; vice-presidents—W. H. Harrison, Philadelphia; Mark Eldridge, Memphis; R. H. Fair, Omaha; N. B. Hinson, Los Angeles; C. V. Christie, Montreal. New directors added were: C. R. Jones, New York; W. B. Kouwenhoven, Baltimore; G. C. Shaad, Lawrence, Kans. The national treasurer is W. I. Slichter, New York, re-elected.

PERSONALS

F. E. GARDNER, for 30 years associated with Gardner Machine Co., Beloit, Wis., has resigned as vice-president and member of the board. He will be succeeded by W. B. LEISHMAN who has been identified with the company for 22 years.

SIDNEY DIAMANT, president and general manager of the Diamant Tool & Manufacturing Co., Inc., Newark, N. J., has been elected president of the Hudson River Valley Division of the Special Tool, Die and Machine Shop Institute, Inc.

E. J. MCDONNELL has been appointed vice-president of the industrial division of Blaw-Knox Co., Blawnox, Pa., and L. A. PRESCOTT has been made vice-president of the engineering division.

COLONEL V. A. ROOT, for many years sales manager of the W. F. & John Barnes Co., Rockford, Ill., has been appointed sales manager of the Seneca Falls Machine Co., Seneca Falls, New York, N. Y. JOSEPH H. FLATHER, formerly president of The Flather Co., Nashua, N. H., was appointed chief engineer.

FRANK W. CURTIS, research engineer, Kearney & Trecker Corp., has recently resigned that position. During the six years he was with Kearney & Trecker, Mr. Curtis' work had to do with the design and sales work on special machines, attachments and tooling for high production manufacturing. He also contributed to the development of new products in the Kearney & Trecker line, and devoted much time to the promotion of the use of tungsten-carbide milling cutters. Mr. Curtis was formerly Western Editor of *American Machinist*.

CLARENCE HAYES has been elected president of the Hayes Industries, Inc., manufacturers of automotive fans, and parts and equipment for the aircraft industry, Jackson, Mich.

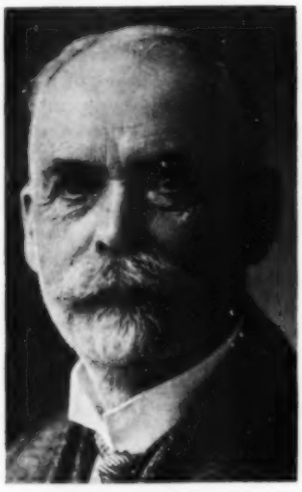
OBITUARIES

WALTER FRANK DIXON, works manager of the Elizabethport, N. J., plant of the Singer Manufacturing Co., and vice-president of the Diehl Manufacturing Co., the electric division of the Singer Manufacturing Co., died June 18 at the age of 70. Mr. Dixon was born in London. He worked as a draftsman for the Barney & Smith Car Co., Dayton, Ohio, then as locomotive designer of the Cooke Locomotive Works, Paterson, N. J., mechanical engineer for the Rogers Locomotive Works, Paterson, N. J., and chief engineer of the locomotive department of Sormovo Works, Russia. In 1900 he became manager of the Singer Manufacturing Company's plant at Podolsk, Russia, and remained there until 1917. He returned to this country in 1918 as special representative of the company and became works manager at Elizabethport in 1920. He was the author of many papers and was a life member of the American Society of Mechanical Engineers and a member of the Institute of Mechanical Engineers (British).

FRANK OREN WELLS, 80, co-founder of the Wells Bros. firm at Greenfield, Mass., makers of taps and dies, which with several smaller plants was consolidated in 1912 to form the Greenfield Tap & Die Corporation, died June 23. Mr. Wells was president of the corporation for the first seven years after the consolidation and then held the post of vice-president for many years. In 1924 he founded and was president of the Wells Tap & Die Company. He was the proprietor of the Wells Manufacturing Company, a member of the National Screw Thread Commission, and a former governor of the American Society of Mechanical Engineers.

CHARLES KUGLER, who contributed numerous articles to *American Machinist*, died in Philadelphia on June 23 at the age of 84. Mr. Kugler wrote particularly for the Ideas from Practical Men department. His work was highly regarded for its accuracy and drew many appreciative comments from readers.

W. F. DIXON



F. O. WELLS

FRANK P. KNOWLES, director and member of the executive committee, Crompton & Knowles Loom Works, Worcester, Mass., died June 13. Mr. Knowles was connected with the textile-equipment manufacturing firm for 30 years, prior to his retirement in 1916. He was 82 years old.

FRANK H. STREINE, designer and builder of metal-finishing machinery, died June 15 from injuries received in an automobile accident. Mr. Streine was head of the finishing-machinery division of Macintosh-Hemphill Co., Pittsburgh, Pa.

FRANK HASKELL BOYER, co-founder of the Burroughs Adding Machine Co., Detroit, and an organizer of the Chicago Pneumatic Tool Co., died June 24 at the age of 58.

WILLIAM G. MARWOOD, 59, superintendent of the Franklin Valveless Gas Engine Co., Franklin, Pa., and connected with that concern for the past 30 years, died recently.

BUSINESS ITEMS

The General Machinery Corp., 120 Federal St., Boston, Mass., has been appointed by the Erie Foundry Co., Erie, Pa., to represent it in Maine, New Hampshire, Vermont, Massachusetts and Rhode Island. The General Machinery Corp. will handle the Erie line of forge shop equipment, including forging hammers, steam drop hammers, board drop hammers, and trimming presses and hydraulic presses.

The Lester Engineering Co., Cleveland, Ohio, announces its reorganization for the purpose of the engineering and sale of Lester die-casting machines. These machines have been manufactured exclusively for N. Lester by Reed-Prentice Corp., Worcester, Mass., since 1925. This has been discontinued and the new company formed.

The Norton Co., Worcester, Mass., has announced that sales of all abrasive products have been combined in one department known as the Abrasive Division. This division will consist of two parts. The first, the Sales Planning and Development, will be in charge of WALLACE T. MONTAGUE. The Sales Operation section will include the Sales Engineering Department, and will be under the direction of W. R. MOORE. All of the foregoing activities are under the direction of W. L. C. NEILSON, vice-president in charge of sales, and H. K. CLARK, general sales manager.

The sale of Ingersoll cutters, manufactured by the Ingersoll Milling Machine Co., Rockford, Ill., is now handled by R. T. PALMER, 883 Farmington Ave., West Hartford, Conn., for New England and northeastern New York. J. A. BOUSLOUGH, 606 North Avenue, Wilkinsburg, Pa., is covering eastern Ohio and the western Pennsylvania territory. The Cleveland and northern Ohio territory is in charge of H. P. BOGGIS, 2075 East 79th St., Cleveland, Ohio.

The Macklin Co., Jackson, Mich., manufacturers of grinding wheels has announced a building program which will mean a 50 per cent increase in their capacity. Ground for the additional buildings between the Wildwood Ave., road and the Michigan Central main lines has already been broken. Officers of the Macklin Co., are T. J. MCINTYRE, president, B. F. MCINTYRE, vice-president and C. H. FRANKLIN, secretary-treasurer.

The Dayton Rogers Mfg. Co., Minneapolis, Minn., has appointed F. C. MILLER at Toledo as representative for metal stampings in small lots and also for the combination angle plate and "Holocater" layout device.

The Quickwork Co., St. Marys, Ohio, is now prepared to rebuild all sizes and makes of inclinable presses, substituting a welded-steel frame for the broken cast-iron frame, and utilizing the working parts taken from the old frame. The work can be done for both flywheel and backgeared presses.

MEETINGS

AMERICAN WELDING SOCIETY. Fall meeting, Sept. 30-Oct. 4. Chicago, Ill. M. M. KELLY, secretary, 33 West 39th St., New York, N. Y.

AMERICAN SOCIETY FOR METALS. Seventeenth annual meeting, Sept. 30-Oct. 4. Palmer House, Chicago, Ill., W. H. EISENMAN, secretary, 7016 Euclid Ave., Chicago.

INTERNATIONAL ACETYLENE ASSOCIATION. Thirty-sixth annual convention, Nov. 12-15. Cleveland Hotel, Cleveland, Ohio. H. F. REINHARD, secretary, 30 East 42d St., New York, N. Y.

NATIONAL METAL EXPOSITION. Seventeenth annual congress, Sept. 30-Oct. 4. International Amphitheater, Chicago, Ill., W. H. EISENMAN, secretary, 7016 Euclid Ave., Cleveland, Ohio.

MACHINE TOOL CONGRESS. Cleveland, Sept. 11-21. Under auspices of National Machine Tool Builders' Association. Participating societies: Machine Shop Practice Division, American Society of Mechanical Engineers; Production Activity Division, Society of Automotive Engineers; American Society of Tool Engineers. HERMAN H. LIND, general manager, 1220 Guarantee Title Bldg., Cleveland.

MACHINE TOOL SHOW. Sept. 11-21, Public Auditorium, Cleveland, Ohio. HERMAN H. LIND, general manager, 1220 Guarantee Title Bldg., Cleveland, Ohio.

SILVER BAY CONFERENCE. Eighteenth annual conference on industrial relations, August 28-31. Silver Bay, Lake George, New York, N. Y. E. C. WORMAN executive secretary, 347 Madison Ave., New York, N. Y.

PATENTS

June 18, 1935

Metal-Working Machinery

Cut-off Machine. Norbert C. Rubin, Cleveland, Ohio, assigned to the McKinney Tool & Mfg. Co. Patent 2,005,052.

Metal Processing Machine. Herbert G. R. Bennett, Duquesne, Pa. Patent 2,005,127.

Cutter Sharpener. Maxwell H. Hill, Rochester, N. Y., assigned to Gleason Works. Patent 2,005,142.

Internal Grinding Machine. Harry Hales Asbridge, Ashton-on-Mersey, England, assigned to the Churchill Machine Tool Co., Ltd. Patent 2,005,331.

Internal Grinding Machine. Harry Hales Asbridge, Ashton-on-Mersey, England, assigned to the Churchill Machine Tool Co., Ltd. Patent 2,005,332.

Automatic All-Metal Spool Making Machine. John G. Jones and Haywood G. Dewey, Rochester, N. Y., assigned to Eastman Kodak Co. Patent 2,005,375.

Bolt Making Machine. William L. Clouse, Tiffin, Ohio, assigned to the National Machinery Co. Patent 2,005,495.

Screeding Machine. Robert D. Shaw, Hartford, Conn., assigned to Pratt & Whitney Co. Patent 2,005,508.

Electrically Operated Lathe. Robert S. Shaw, Hartford, Conn., assigned to Pratt & Whitney Co. Patent 2,005,509.

Automatic Machine Tool Assembly. Richard F. Sanchez and Basil M. Zullo, Brooklyn, N. Y. Patent 2,005,563.

Machine Tool. George Gorton, 3rd, Peter M. Henkes, and George Horner, Racine, Wis., assigned to George Gorton Machine Co. Patent 2,005,696.

Tools and Attachments

Grinding Apparatus. Benjamin O. Isom, Detroit, Mich., assigned to Hutto Engineering Co., Inc. Patent 2,004,949.

Welding Burner. James L. Anderson, Tenafly, N. J., assigned to Air Reduction Co., Inc. Patent 2,005,308.

Grinding Device for Revolving Cutters. Raymore D. MacDonald, Western Springs, Ill., assigned to International Harvester Co. Patent 2,005,551.

Processes

Method of Spot Welding Refractory Metals. William W. Eitel and Jack McCullough, San Bruno, Cal., assigned to Heints & Kaufman, Ltd. Patent 2,005,255.

Method of Making Dies. George R. Meyercord, Chicago, Ill., assigned to Reconstruction Finance Corp. Patent 2,005,591.

Method of Making Lock Nuts. I. C. Emery, Baltimore, Md., assigned to the Lock Nut Corp. of America. Patent 2,005,651.

June 25, 1935

Metal-Working Machinery

Hydraulic Machine Tool. Edward P. Burrell, Shaker Heights, Ohio, assigned to the Warner & Swasey Co. Patent 2,005,822.

Blanking Press. Walter Ferris, Milwaukee, Wis., assigned to the Oilgear Co. Patent 2,006,072.

Apparatus for Working Sheet Metal. Ralph J. Miller, Youngstown, Ohio, assigned to the McKay Machine Co. Patent 2,006,087.

Milling Machine. Frederick William Whitehead, Bristol, England, assigned to the Bristol Aeroplane Co., Ltd. Patent 2,006,119.

Tools and Attachments

Square Shear Gauge. Herman C. Schlack, Detroit, Mich., assigned to Chester A. Kurrash. Patent 2,005,829.

Back Gauge Stop Mechanism. Frederick W. Seybold, Dayton, Ohio, assigned to Harris Seybold Potter Co. Patent 2,005,830.

Valve Seat Grinder. Frans O. Albertson, Sioux City, Iowa, assigned to Albertson & Co., Inc. Patent 2,005,851.

Welding Electrodes. David L. Mathias, Pittsburgh, Pa., assigned to Westinghouse Electric & Mfg. Co. Patent 2,005,902.

Welding Apparatus. Estes C. Drake, Wheeling, W. Va. Patent 2,005,912.

Feed for Sheet Metal Working Machines. Edward V. Crane, Brooklyn, N. Y., assigned to E. W. Bliss Co. Patent 2,006,040.

Dust Collector for Abrading Tools. Felix C. Montouri, Washington, D. C. Patent 2,006,108.

Profiling Attachment for Planers. Howard A. Tham, Akron, Ohio, assigned to the Mechanical Mold & Machine Co. Patent 2,006,121.

Processes

Material for Providing Metal with a Paint Receptive Surface. James H. Gravell, Elkins Park, Pa., assigned to American Chemical Paint Co. Patent 2,005,780.

Method of Making Abrasive Metal Carbides and an Apparatus Therefor. Raymond R. Ridgway, Niagara Falls, N. Y., assigned to Norton Co. Patent 2,005,956.

Method of Machining Cylinders. Kirke W. Connor, Detroit, Mich., assigned to Micromatic Hone Corp. Patent 2,006,158.

Method of Machining Cylinders. Kirke W. Connor, Detroit, Mich., assigned to Micromatic Hone Corp. Patent 2,006,159.

American Machinist — REFERENCE BOOK SHEET ©

Maximum Sprocket Speeds and Chain Velocities

On May 4 the American Gear Manufacturers Association approved the report of the Sprocket Committee relative to standardization of maximum sprocekt speeds and maximum chain velocities for various numbers of teeth in the smaller sprocket. Hitherto the maximum chain velocity has been considered to be about 1,600 ft. per min. regardless of the weight of the chain or the number of teeth in the sprocket. Also, the maximum r.p.m. has been taken as

$$\text{Max. r.p.m.} = \frac{1920}{P}\sqrt{\frac{A}{W_F P}}$$

regardless of the number of impacts of the roller per minute. P = pitch, A = projected area of the roller, and W_F = weight per foot of chain.

Observations of many chain drives over a period of years have shown that much higher chain velocities are permissible under certain conditions and that much lower sprocket speeds should be used under other conditions. The figures compiled in the table are computed from three formulas, each of which expresses a separate limiting condition affecting sprocket speeds and chain velocities.

The upper figure in each square is the maximum r.p.m., and the lower figure is the corresponding maximum chain velocity which is found by multiplying the maximum r.p.m. by the product of the number of teeth and the pitch, and then dividing by 12. Figures in the upper left-hand block are calculated from the formula:

$$\text{Max. r.p.m.} = \frac{2000}{P}\sqrt[3]{\frac{A}{W_F}}$$

based on the theory that the allowable energy of roller impact per tooth per minute should not exceed a certain maximum. P = pitch; A = projected area of the roller, and W_F = weight per foot of chain.

Figures in the lower block are calculated from the formula:

$$\text{Max. r.p.m.} = \frac{1920}{P}\sqrt{\frac{A}{W_F P}}$$

based on the theory that the allowable energy of a single roller impact should not exceed a certain maximum.

Figures in the upper right-hand block are calculated from the formula:

$$\text{Max. r.p.m.} = \frac{9516}{P}\sqrt{\frac{A}{N W_F}}$$

based on the theory that the maximum allowable centrifugal force for one chain link is proportional to the projected area of the roller. N = number of teeth in smaller sprocket.

The tabulated figures are in each case the least of those yielded by the three formulas.

Examination of the table will show that, for chain No. 41 running over sprockets with not less than 54 teeth, the chain velocity can be as high as 3,195 ft. per min., while a 2½-in. pitch chain over a 9-tooth wheel should not run at a velocity exceeding 450 ft. per min. Also, it will be seen that in the case of chain No. 50 operating over a 15-tooth sprocket the maximum r.p.m. is 1,900 while a 54-tooth sprocket has a permissible speed of only 1,028 r.p.m.

MAXIMUM R.P.M. AND MAXIMUM CHAIN VELOCITIES FOR AMERICAN STANDARD ROLLER CHAINS

Upper figures are max. R.P.M. Lower figures are max. chain velocities (ft. per min)

Chain No.	Pitch	Roll Diam.	No. of teeth in smaller sprocket															
			7	9	11	13	14	15	16	17	20	24	28	32	37	48	54	62
35 N	3/8	0.200	3043 667	3043 857	3043 1048	3043 1238	2935 1284	2835 1330	2744 1373	2662 1414	2455 1524	2240 1680	2073 1817	1940 1940	1805 2088	1585 2377	1495 2520	1395 2700
41	1/2	0.306	2654 772	2654 993	2654 1213	2654 1434	2654 1545	2654 1655	2580 1718	2500 1770	2306 1920	2106 2100	1950 2275	1823 2428	1695 2612	1488 2973	1407 3195	1310 3380
40	1/2	5/16	2517 732	2517 942	2517 1150	2517 1360	2517 1465	2460 1534	2381 1585	2310 1634	2130 1770	1945 1940	1800 2100	1685 2240	1567 2411	1375 2748	1298 2910	1210 3120
50	5/8	0.400	1900 692	1900 890	1900 1089	1900 1287	1900 1384	1900 1480	1885 1570	1830 1620	1688 1760	1542 1925	1426 2080	1335 2222	1241 2390	1089 2722	1028 2885	958 3095
60	3/4	15/32	1500 657	1500 844	1500 1032	1500 1220	1500 1313	1500 1407	1500 1500	1500 1584	1392 1740	1270 1905	1176 2060	1100 2200	1023 2368	898 2697	848 2860	791 3061
80	1	5/8	940 549	940 705	940 862	940 1019	940 1097	940 1173	940 1254	940 1330	940 1567	940 1880	885 2032	828 2195	771 2360	677 2690	638 2850	594 3055
100	1 1/4	3/4	645 470	645 604	645 738	645 872	645 940	645 1010	645 1075	645 1145	645 1347	645 1612	645 1880	639 2131	593 2292	522 2611	492 2768	459 2968
120	1 1/2	7/8	520 455	520 585	520 715	520 845	520 910	520 975	520 1040	520 1104	520 1300	520 1560	520 1820	520 2080	515 2385	453 2715	427 2878	398 3085
140	1 3/4	1	370 378	370 486	370 594	370 702	370 756	370 810	370 864	370 917	370 1080	370 1296	370 1510	370 1728	370 1996	370 2590	364 2851	339 3060
160	2	1 1/8	325 379	325 487	325 595	325 704	325 758	325 813	325 867	325 922	325 1083	325 1300	325 1516	325 1734	325 2003	325 2600	301 2708	281 2905
200	2 1/2	1 9/16	240 350	240 450	240 550	240 650	240 700	240 750	240 800	240 850	240 1000	240 1200	240 1400	240 1600	240 1850	240 2400	240 2700	229 2955

Ideas FROM PRACTICAL MEN

A Drilling Expedient

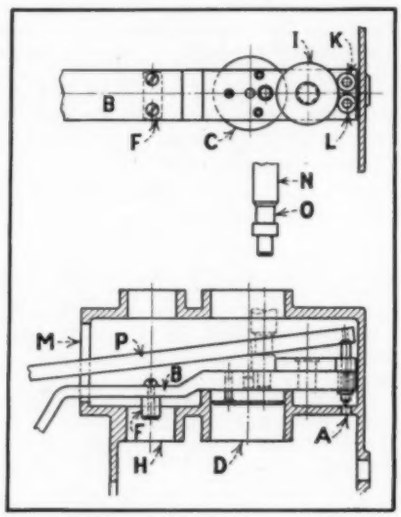
H. THORNTON

Through a mistake in the foundry, the cored opening at *A* was omitted from a large quantity of gear cases such as the one illustrated. Since this opening was necessary to maintain the oil level in the two adjoining chambers when the case was in its normal position, we decided to make it by drilling two ⅜-in. holes instead of one large one. As the distance between the web to be drilled and the outer part of the case is but 3½ in., some ingenuity was required to design a device for doing the work without drilling through the outside of the case.

To carry the drills, the flat bar *B* was provided with the pilot *C* to fit in the bored hole *D*, and the flat piece *F* with rounded ends to fit in the bored hole *H*. The pilot was to locate the bar and the flat piece was to prevent the bar from swinging on the pilot as a center. The large gear *I* and the two small gears *K* and *L* were mounted on the bar. The two small gears had long hubs and carried two short drills that were keywayed and were driven by feather keys in the hubs.

The bar was entered through opening *M* of the case and was located by the pilot *C*. A short length of pinion rod was held in the drill press spindle, the end being turned down to serve as a pilot to engage a pilot hole in the bar. It was also necked at *O* to permit the forked end of the feed lever *P* to straddle it. The forked ends of the feed lever were deeply countersunk to engage the pointed ends of the drill shanks.

With everything in place, the drill press spindle was lowered to mesh the teeth of the pinion rod with the teeth of the large gear, the drill press was started. Feed for the drills was applied by lifting up on the outer end of the feed lever, the crotch of which fulcrumed on the rounded shoulder of the pinion rod above the part that was necked to a smaller diameter.



Short drills sliding on feather keys in the hubs of the small gears are driven by the large gear through a pinion rod in the drill press spindle

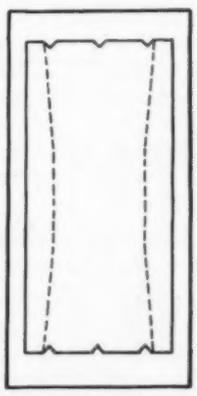
Accurate Cylinders for Testing Squares

A. F. PARKER
University of Michigan

Among the accurate, but seldom used, precision tools is the cylinder for testing squares. But one maker lists such a tool and the price is beyond the reach of the pocketbooks of most toolmakers.

Recently, while discussing precision tools with an experienced toolmaker, he showed me what his idea was of an accurate cylinder for testing his squares. It was nothing but a piston pin for a diesel engine. He had nicked the ends with a V-shaped wheel, as shown in the illustration, and then ground and lapped them accurately, perpendicular to the axis.

Such pins are within 0.0001 of diameter and parallelism. They are made of S.A.E. 1020 steel and are heat-treated for strength and hardness to 62 Rockwell C. Their lapped surfaces leave little to be desired for finish and their weight is but one-half to three-quarters that of standard cylindrical test pieces.



A piston pin for a diesel engine having the ends ground and lapped perpendicular to the axis makes an ideal cylinder for testing squares

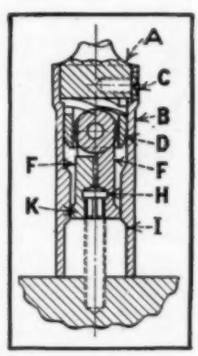
Tool for Setting Studs

OSCAR W. NOWLIN
Oshawa, Ontario, Canada

The tool illustrated will drive studs quickly to a uniform depth. It consists of the shank *A* tapered to fit the spindle of the drill press and having a four-jaw clutch at its lower end; the outer sleeve *B* threaded to fit the shank and held in place by the screw *C;* the inner sleeve *D* having teeth at its upper end to engage the four-jaw clutch on the shank, and free to revolve and slide within the outer sleeve; the jaws *F* tapped to suit the studs to be driven and pivoted to the inner sleeve; and the stop *H*, which is a piece of round steel held in a recess in the jaws.

In operation, the tool is lowered over the stud to be driven, which has been started by hand. When the stop *H* contacts with the stud, the downward movement of the inner sleeve and the jaws is arrested, while that of the shank and the outer sleeve continues. Continuing the downward movement, the angular surface *I* of the outer sleeve contacts the angular surfaces *K* of the jaws, forcing them inward and causing them to grip the stud.

Further downward movement causes the four-jaw clutch in the lower end



Studs can be quickly driven to a uniform depth by this tool. The tool can be used in either a drill press or a portable drill

of the shank to engage the teeth in the upper end of the inner sleeve, rotating it and the jaws and causing the jaws to rotate the stud. When the stud has been screwed far enough into the work to bring the lower end of the outer sleeve into contact with the surface of the work, the jaws continue to drive the stud until its descent draws down the inner sleeve far enough to disengage its teeth from the four-jaw clutch on the lower end of the shank.

At this point, the jaws and the inner sleeve cease to revolve and the stud is driven no farther. Raising the tool until the angular surface *I* clears the angular surfaces *K* on the jaws, permits the jaws to open and release the stud. Then the tool can be raised clear of the stud.

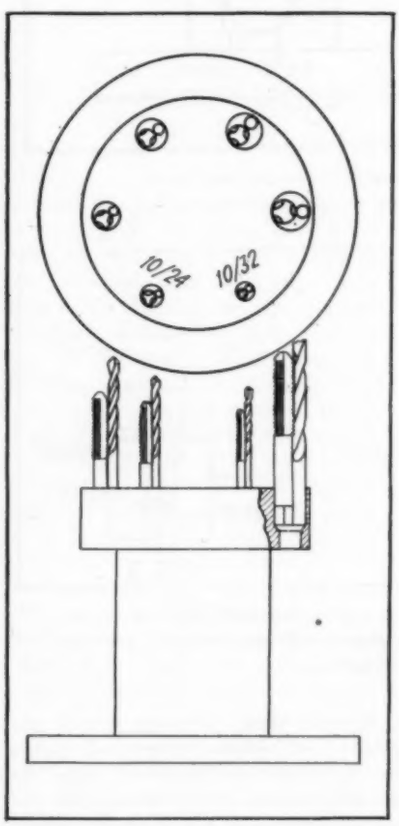
Foolproof Holder for Taps and Tap Drills

H. MOORE
Hamilton, Ontario, Canada

A good way to avoid using the wrong size tap drill is to keep the tap and the drill together. A holder of the type illustrated is well adapted for holding taps and drills for machine screws, where plug taps only are necessary.

Blind holes of a diameter large enough for both taps and tap drills of various sizes are drilled in the upper flange of the holder. From the bottoms of these holes, clearance holes for the various size taps and tap drills are drilled completely through the flange.

If either the tap or the drill is removed separately, the other will fall through the clearance hole, and if either is put in the hole singly, it also will drop through the clearance hole. The tap or the drill dropping through the clearance hole, and the empty hole, at once call attention to the fact that the tools are missing. The sizes of the taps should be stamped on the flange close to the holes.



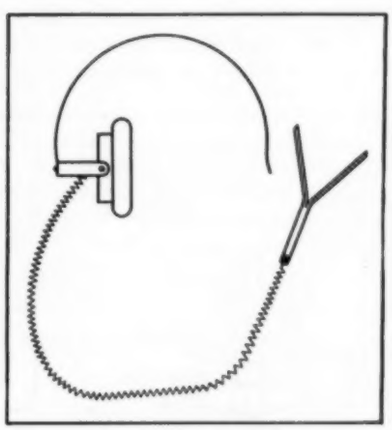
Unless taps and drills are put into or removed from the holes together, one or the other will fall through the clearance holes

Stethoscope for Detecting Machine Noises—Discussion

C. F. FITZ

Referring to the stethoscope described by C. W. Hinman in an article under the title given above (*AM*—Vol. 78, page 483), I think the one here illustrated is an improvement. The only difference between it and the one described by Mr. Hinman is that, instead of the free end of the spring terminating in a pin, it terminates in a rod that is split to make a fork. The fork acts on the principle of a tuning fork and is more sensitive to noise and vibrations than is a pin.

In use, one of the fork ends is placed against the suspected noisy bearing.



One end of the spring terminates in a forked rod, which acts on the principal of a turning fork and responds to slight noises or vibrations

Calipering a Three-Point Diameter—Discussion

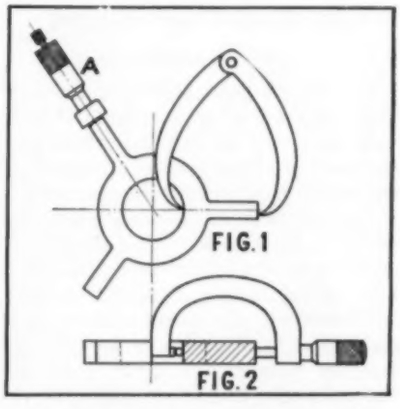
PAUL C. BRUHL

Referring to the article by H. Moore under the title given above (*AM*—Vol. 79, page 331), I herewith submit a simpler method for calipering the dimension over the wings of a bushing.

Since the bore has been machined, it would be much simpler to insert one leg of the caliper in the bore and place the other leg over one of the wings, as shown in Fig. 1. Then, twice the opening of the caliper plus the diameter of the bore will equal the diameter over the wings.

If greater accuracy is required, a micrometer caliper in connection with a small ball in the bore and bearing against the anvil of the micrometer can be employed, as indicated in Fig. 2. In this case the micrometer reading minus the diameter of the ball, multiplied by two, plus the diameter of the bore will equal the diameter over the wings. Either of these methods is better than measuring from the sharp point of a cutting tool, which requires that the tool point be accurately diametrically opposite the narrow wing, making a mistake possible.

Since the bushing has to be bored and turned, it is presumed that both these operations are performed while it is in the chuck. If it were mounted on a mandrel for the turning operation, neither of the above methods could be employed. In that case a depth micrometer, as shown at *A* in Fig. 1, could be used for measuring the distance from the mandrel to the outside of one of the wings. Then, twice the micrometer reading plus the diameter of either the bore or the mandrel will equal the diameter over the wings.



The diameter over the wings is twice the opening of the calipers plus the diameter of the bore. Ordinary calipers, a micrometer or a depth gage can be used

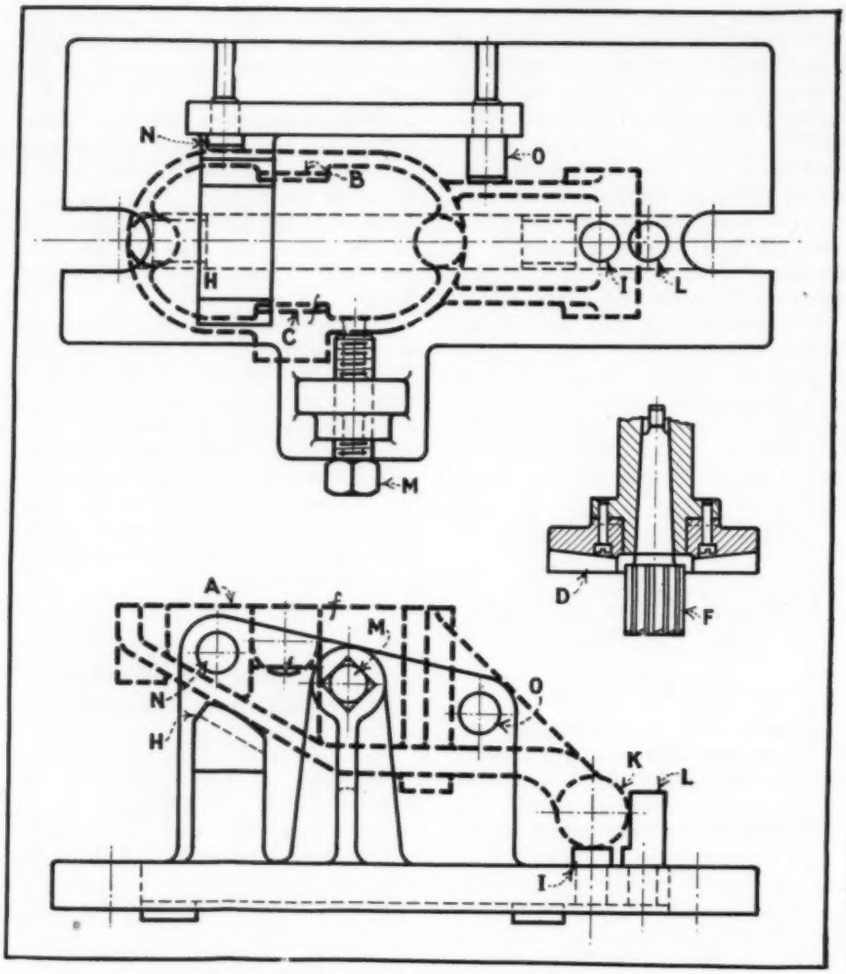
Fixture and Cutters for Two Operations

F. SERVER

The work indicated by heavy dotted lines is to have the top *A* and the inner faces of the inside bosses *B* and *C* machined at one setting by the combination cutters shown at the right, of which *D* is a face mill and *F* is an end mill. The work is located in the fixture on three points, two near the left-hand end on the ends of block *H* and one at the opposite end on pin *I* under the end boss *K*. The work is prevented from shifting endwise by stop pin *L*. Clamp screw *M* forces the work against pins *N* and *O* to both hold and square it.

In operation, with the cutters over the work, the knee of the machine is raised against a stop to bring the work into contact with the face mill at the correct depth. The longitudinal and cross feeds are then manipulated so that the face mill will mill the top of the work and the side of the end mill will mill the inner faces of the inside bosses *B* and *C*. Cross-feed and table stops are provided so that the distance between the faces of the bosses will be correct, and that the end mill will not contact with the inside ends of the work.

The end boss *K* is finished by straddle milling in another fixture, in which the work is turned upside down so that the finished top will be below and will rest on a flat seat. In this position it is squared by bringing the finished face of one of the inside bosses against a block by means of a clamping screw. It is held down by ordinary strap clamps.



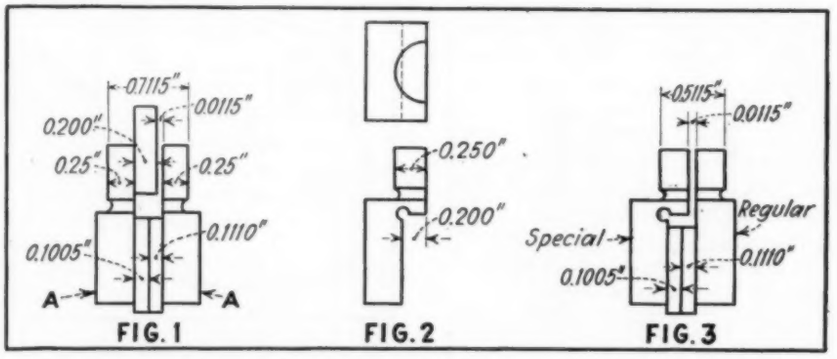
The top of the work and the inner faces of the two inside bosses are milled at one setting by the combination cutters

End Pieces for Use With Gage Block Combinations

WALTER KASSEBOHM

In sets of gage blocks, individual blocks are not made in lengths of less than 0.100 in., so that difficulties are encountered when smaller dimensions are required for direct measurements.

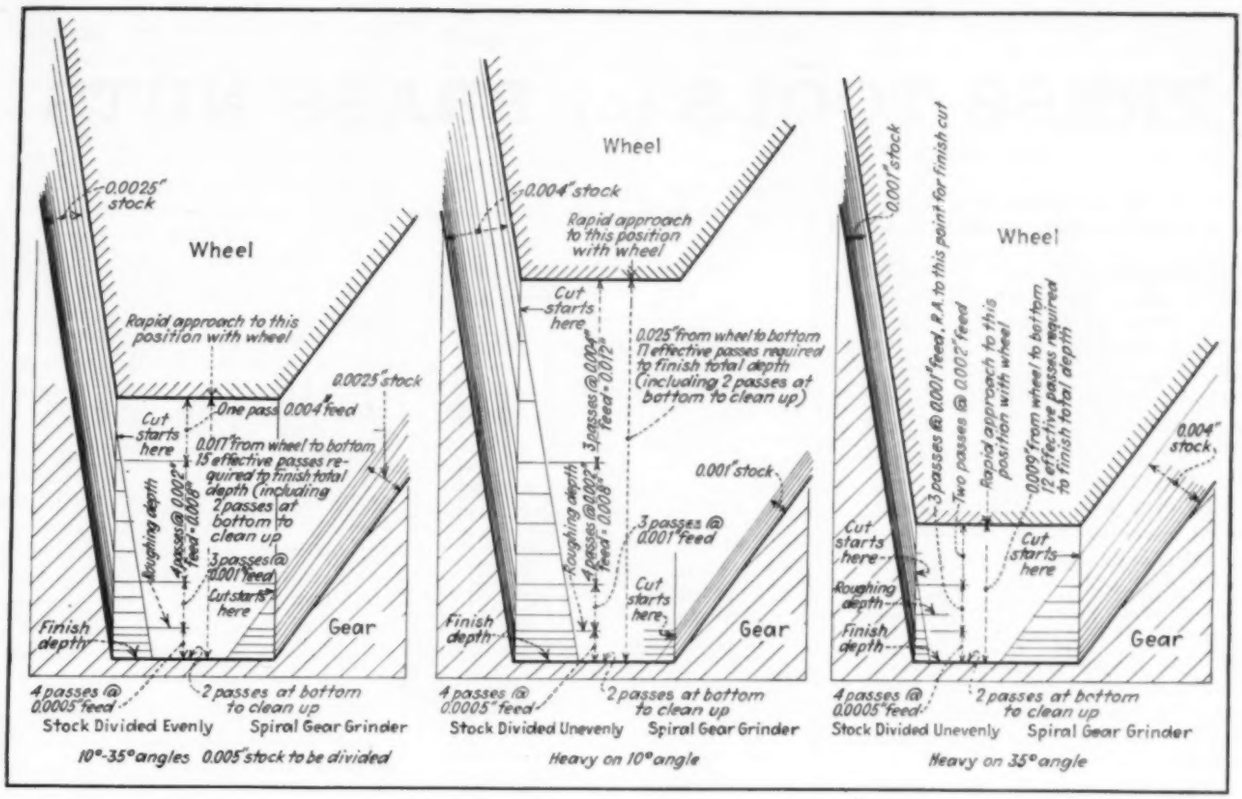
Suppose that an accurate space of 0.0115 in. is wanted. By making end pieces as at *A*, Fig. 1, they can be used with combinations of 0.1005, 0.1110 and 0.2000-in. gage blocks. The 0.1005 and the 0.1110-in. blocks are placed together between the lower parts of the end pieces, and the 0.2000-in. block is placed between the upper parts as a "subtraction" block. Then the required space of 0.0115 in. is found between the 0.2000-in. block and one of the end pieces.



By the use of the end pieces illustrated in connection with different combinations of gage blocks, smaller spacings than would otherwise be possible can easily be obtained

Another method is to make a special end piece having an accurate step of 0.2000 in. ground and lapped, as in Fig. 2. By using this special end piece in connection with one of the regular end pieces, as in Fig. 3, the 0.1005 and the 0.1110-in. blocks are placed between them and the space of 0.0115 in. is obtained without the 0.2000-in. block.

A wider range of spaces can be obtained by making other end pieces having 0.3000 and 0.4000-in. steps. In actual practice it was found that the use of the special end piece in connection with one of the regular end pieces and different combinations of gage blocks simplified checking to a great extent.


0.0025" stock
Wheel
Rapid approach to this position with wheel
0.0025" stock
One pass 0.004 feed
Cut starts here
0.011" from wheel to bottom, 15 effective passes required to finish total depth (including 2 passes at bottom to clean up
4 passes @ 0.002" feed - 0.008"
Roughing depth
3 passes @ 0.001" feed
Cut starts here
Finish depth
Gear
4 passes @ 0.0005" feed
2 passes at bottom to clean up
Stock Divided Evenly
Spiral Gear Grinder
10°-35° angles 0.005" stock to be divided
Wheel
0.004" stock
Rapid approach to this position with wheel
Cut starts here
0.025" from wheel to bottom
11 effective passes required to finish total depth (including 2 passes at bottom to clean up)
3 passes @ 0.004" feed - 0.012"
0.001" stock
3 passes @ 0.001" feed
Roughing depth
4 passes @ 0.002" feed - 0.008"
Cut starts here
Finish depth
Gear
4 passes @ 0.0005" feed
2 passes at bottom to clean up
Stock Divided Unevenly
Spiral Gear Grinder
Heavy on 10° angle
0.001" stock
3 passes @ 0.001" feed, P.A. to this point for finish cut
Two passes @ 0.002" feed
Rapid approach to this position with wheel
0.009" from wheel to bottom, 12 effective passes required to finish total depth
Wheel
0.004" stock
Cut starts here
Cut starts here
Roughing depth
Finish depth
Gear
4 passes @ 0.0005" feed
2 passes at bottom to clean up
Stock Divided Unevenly
Spiral Gear Grinder
Heavy on 35° angle

Stock Control for Spiral Bevel Gears

HARRY LITTLE

The problem of dividing the stock on hardened spiral gear teeth depends on the warpage of the teeth during the quenching operation. The quenching press is fitted with a plate, clamp which holds the ring gear to a fairly even shape during quenching, but the shape of the teeth after quenching may bring one of three different conditions in dividing the stock to be removed. If the gear teeth remain uniform, they will come out of the quenching operation with the stock divided evenly. If there is warpage the stock may be heavy on the acute angle side or vice versa as the case may be.

As illustrated in the production studies, with the stock divided evenly, fifteen passes will be required to finish. In case of the stock being heavy on the steep side of the tooth, seventeen passes will be required to finish. In the case of the stock being heavy on the flat side of the tooth, only twelve passes will be required to finish. While this may not seem like a great difference yet it must be noted that in a gear of one hundred teeth the difference between extreme conditions would be a matter of 500 passes of the grinding wheel which would add appreciably to the production time for the piece.

As will be seen from the production studies illustrated, the best possible condition for the balance of the grinding wheel pressure in the cut and for production time is with the stock heavy on the flat angle side of the tooth.

Tooth profile comparator projections will reveal the division of the stock; control may be established depending on the metal warping characteristic, to hold the division most advantageous for production.

Fastening Drawing Paper Discussion

IRA S. WILLIAMS

In an article under the title given above (*AM*—Vol. 79, page 375), Bert Wallace suggests the use of a Bostich stapler for attaching paper to the drawing board.

Another excellent method of accomplishing the same purpose is to use Scotch decorator's tape such as is used by painters and decorators for attaching masking mediums to objects they are painting. By using this tape no holes are made in the drawing board and there are no projections above the drawing surface. The tape is readily removed and leaves no blemish.

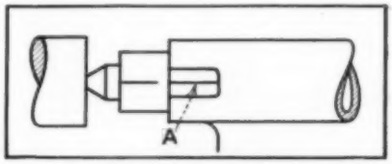
Gage for Setting Lathe Tools Discussion

J. T. TOWLSON
London, England

In an article under the title given above (*AM*—Vol. 79, page 58), George J. Murdock describes an ingenious device for setting lathe tools to center height. But why go to the expense of providing such a device? All that is necessary is to scribe a line at center height either on the nose of the tailstock or on the tailstock spindle, as at *A* in the illustration.

It is sometimes necessary to set the tool above or below center height. In such a case, the tool can be set the required amount above or below one of the lines referred to.

Should the work be such that to reach either of the lines with the tool, then the tool can be set by simple measurement with any steel rule.



Lines scribed at center height are convenient for setting the tool to correct height

PRESS TOOLS for BRASS NUTS

C. W. HINMAN
Scripto Manufacturing Company

Combination press tools for making special nuts of thin brass in a double-action press are illustrated in Fig. 1, in which one of the nuts is shown at *A*. The threading is, of course, done in another operation. The tools are shown in the closed position with both inner and outer slides at the bottoms of their strokes.

The strip stock *B* is fed from right to left across the face of the die-block *C*, which is positively attached to the die-block *D*, while the blanking punch *F* is similarly attached to the punch holder *H*. The punch holder is attached to the face of the blank-holder ram, which is the outer sliding member. The inner sliding member operates the drawing punch *I* which is attached to it.

At the first station, a $\frac{3}{16}$-in. hole is pierced in the strip, which is then advanced to the second station. Here the blanking tools cut a round blank from the strip, and the blank is carried down between the faces of the blanking punch *F* and the spring pad

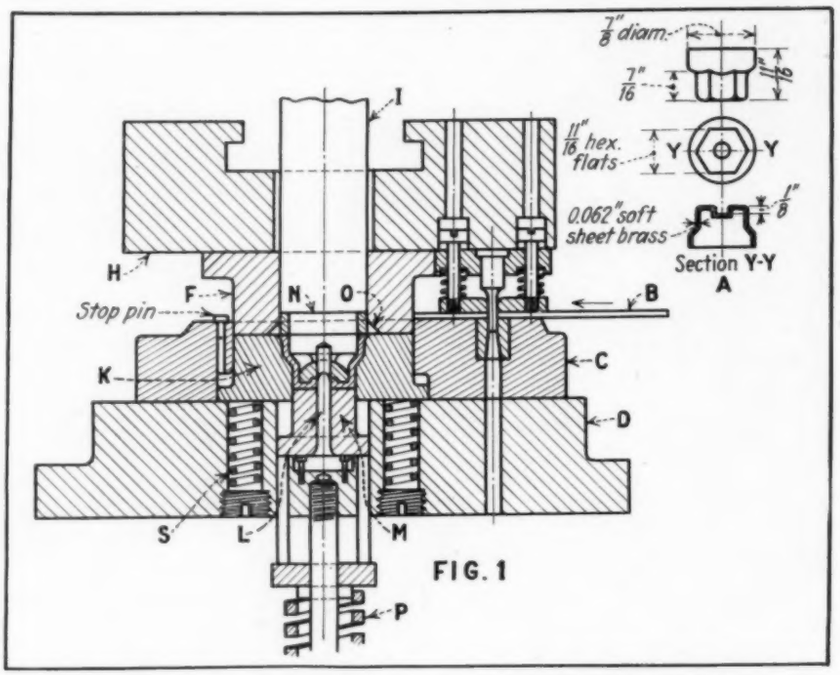


FIG. 1

Fig. 1—Special brass nuts at A are produced in a double-action press with these two-station piercing, blanking and drawing tools, one nut at each stroke of the press

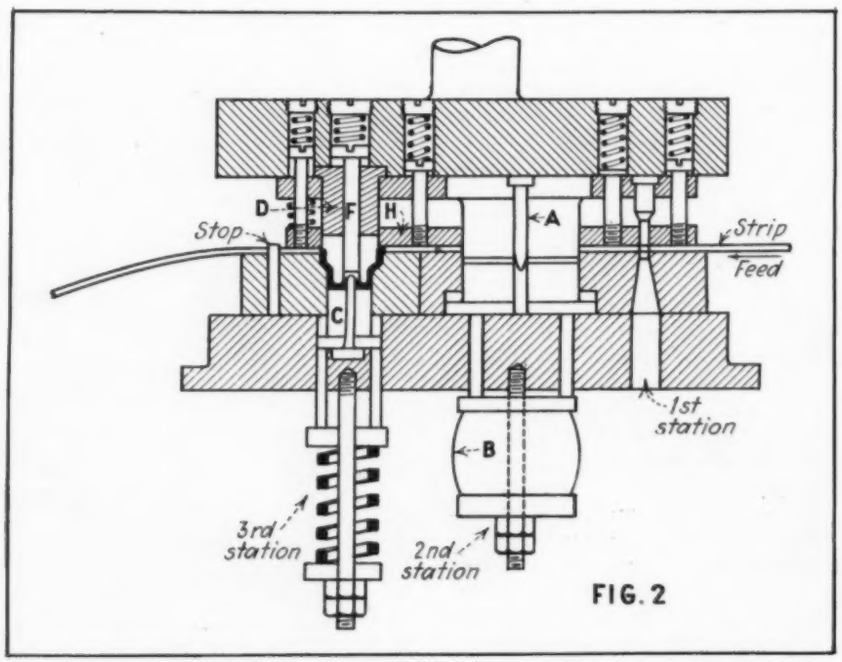


FIG. 2

Fig. 2—Three-station combination tools for producing the nut in a single-action press. The pierced blank is pushed back into the strip by the action of a rubber bumper

K. The spring pad positively "banks" against the die-shoe, exposing the positive pin *L*, the bullet-shaped point of which enters the $\frac{3}{16}$-in. hole and embosses it inwardly to the correct size.

The spring pad contains the drawing die. The spring shedder *M* is depressed when the drawing punch forces the blank down into the drawing die. The wrinkles are ironed out of the blank between the faces of the blanking punch and the spring shedder. The hex corners of the work are drawn almost sharp because most of the metal flow occurs toward the sharp corners in the die.

The drawing punch is provided with a "pinching-off" ring *N* that trims off the irregular edges around the top of the work against the $\frac{1}{8}$-in. radius in the position shown. The piece trimmed off is forced by the cut into the opening *O* in the blanking punch and is ejected when the drawing punch ascends through the blanking punch.

At the bottom of the stroke of the drawing punch, the shedder positively

"banks" in the die-shoe around pin *L*, "spanking" the work into full shape and tending further to produce sharp hex corners. On the upstroke of the press, the finished work is ejected by the shedder, which follows it up flush with the surface of the die-block by means of the strong compression spring *P*. Simultaneously, springs *S* return the spring pad flush with the surface of the die-block. The finished work cannot remain on the drawing punch, for if it did stick to the punch instead of in the die, it would be stripped from the punch when ascending through the blanking punch.

The nut can also be made in a single-action press by the combination three-station tools illustrated in Fig. 2. At the first station, a $\frac{3}{16}$-in. hole is pierced in the strip. At the second station, a round blank is punched from the strip, the strip being located by the pilot *A* entering the $\frac{3}{16}$-in. hole just pierced. The blank is then pushed back into the strip by the action of the rubber bumper *B* and the strip is fed.

At the third station, the blank is drawn, the center hole is embossed inwardly to the correct size and the irregular top of the work is "pinch trimmed" by a ring. As the ram ascends, the spring-actuated shedder *C* follows up the work, which is stripped from the drawing punch *D* by the strippers *F* and *H*, after which it is blown from the tools by an air jet.

Initial Structure Affects Steel Hardening

Work in progress at the Bureau of Standards on the hardening characteristics of 1.00 per cent carbon steels clearly demonstrates that the critical quenching rate of a steel of this type depends not only upon the grain size characteristics of austenite, the high temperature constituent of steel, but also upon the initial structure, existing in the steel before it is heated for quenching and hardening. For example, identical samples of a specific steel, which was not a so-called "controlled grain size" steel, were heat-treated to produce microstructures which were widely different, coarsely grained lamellar pearlite in one case, and completely sorbitic structure in the second. The pearlitic specimen when quenched in brine from 773 C (1,425 F) was more brittle, hardened to a greater depth and had a coarser grained fracture than the companion sorbitic specimen after being quenched from 815 C (1,500 F).

It appears possible, therefore, to change a steel from a "deep hardening" to a "shallow hardening" steel, or vice versa, not only by suitably changing the temperature attained just prior to quenching, but also by changing its initial microstructure. The effect of the initial structure may completely offset the effect of an increase in quenching temperature which might bring about deeper hardening.

Safety on Special Machines

Designers of standard machines for the most part are now conscious of the products. In making special machines need for building safety into their or fixtures, however, this consideration is too often neglected. At a recent meeting of the Detroit sectional meeting of the Industrial Safety Council, J. K. Fulks of the Ex-Cell-O Aircraft and Tool Corporation, told how his concern takes account of this activity.

"With reference to the construction of standard or special machine tools and fixtures, in building into these products safety features that may help reduce accidents we are always looking for ways and means of improving our product.

"In the design of special fixtures, our engineering department tries to follow the general plan of having any hand-operated locator, clamp or control in the clear of the machine and, wherever possible, tieing in the machine operation control with the clamp in such an interlocking way that the machine cannot be started through its cycle until the part is properly located and clamped, and the operator is in a safe position.

"We recently designed and built a large machine where there were fourteen distinct movements required to load, clamp, index machine and unload, and it was essential that these operations be so interlocked that the operator could not in any way cause a wreck or place himself in a dangerous position while operating the machine. After considerable engineering, this was accomplished by hydraulically and electrically interlocking the sequence of these movements in such a way that the operator had to stand in a definite position and hold the control lever in the operating position until the cycle was completed.

"In another case, on our precision boring machine, the parts were to be loaded by an operator on each end of the machine. The operator on one end of the machine loaded and unloaded while the work was being machined on the opposite end, or they might both be loading and unloading at the same time. Now you can see how it would be possible under such conditions if either man could start the machine without the other man being in the clear, serious injury might result. This was protected by so arranging the automatic features of the machine that the machine would stop at each end after completing the operation on that end, and before it could automatically produce parts on the other end of the machine, both men had to put their hands on a safety control handle. This machine has been producing parts at about 700 per hour for nearly two years and there has never been an accident causing injury to either operator."

Traditional Methods Discussion

JOHN E. HYLER

The editorial under the title given above (*AM*—Vol. 79, page 240b) is calculated to awaken a train of thought to discover better methods. Because a method is traditional it does not follow that it is best. On the other hand, the fact that a method is traditional is nothing against it. The trouble with traditional methods is that we too often fall into a state of inertia concerning them, and it never even occurs to us that a better method might be found.

The acid test for all methods, new or old, is continual application of the word "why" in all of its possible variations. Why is this job done on a lathe? Why is this part circular in sections? Why not square, hexagonal, oval or elliptical? Why is it made of this particular material? Why not make it of that? Why, in fact, do we need to make the part at all? Why could not a method be found to dispense with it? Why could it not be combined with another part? Why not be replaced by a simpler and better part? Why, in any event, could not some better method of machining it be found?

There are literally thousands of ways that can be applied to every job. It does not follow that it will pay to become a visionary and squander productive time in research so prolonged as to be inconsistant. But it does pay to remember continually that nothing else is so permanent in industry as change, and that those who first find the better way lead the procession.

Universal Screw Slotting Attachment

HENRY C. SEEGERS

The screw slotting attachment illustrated can be mounted on the milling machine, lathe or other machine having a horizontal spindle. If mounted on the milling machine, the knee must be adjusted to the correct height, but the table remains stationary, as the feed is by the rotary movement of the carrier holding the screws to be slotted. If the attachment is mounted on the lathe or another machine having a horizontal spindle, but not having a table adjustable for height, then it must be blocked up so that the cutter arbor is in line with the spindle.

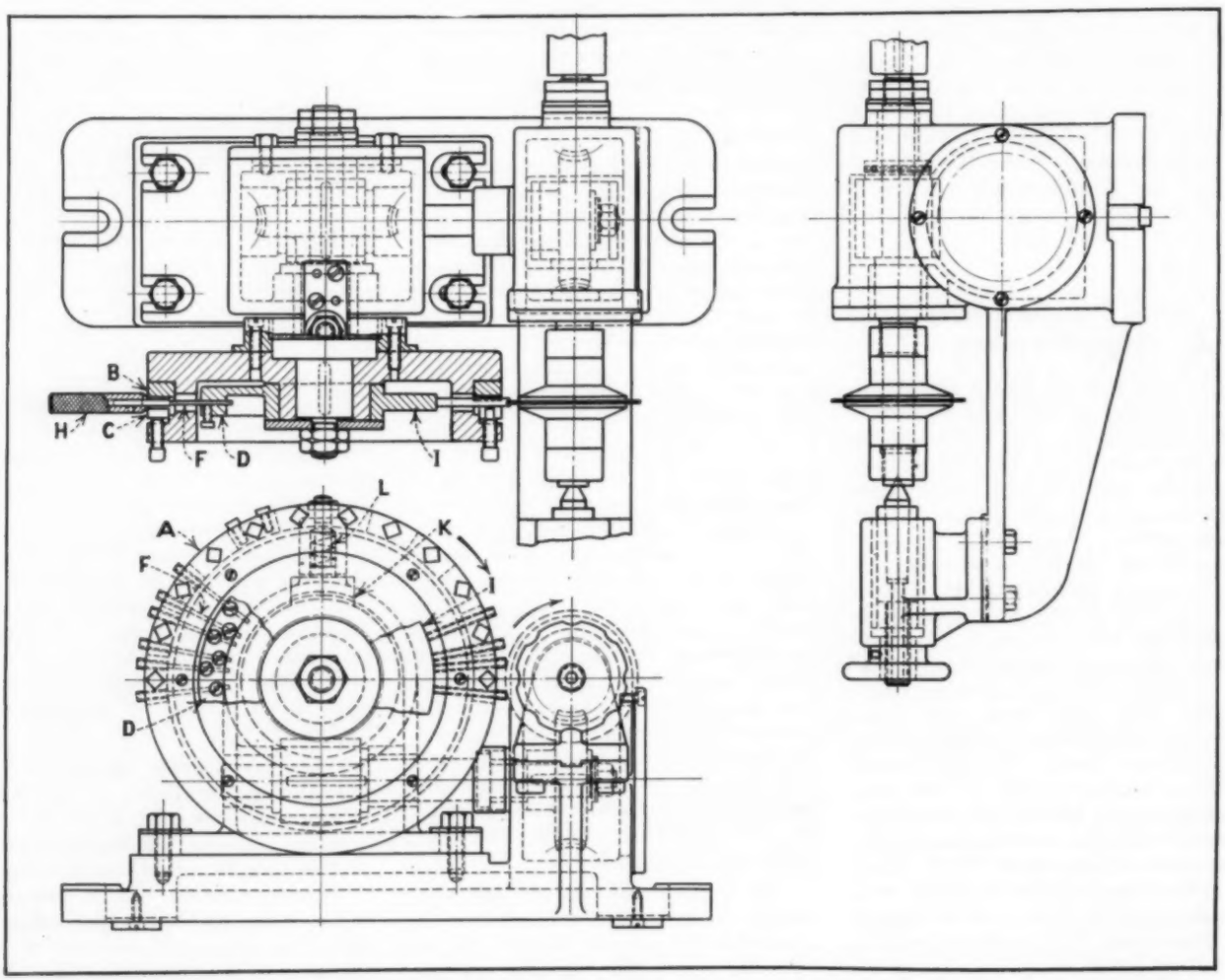
Since the carrier is driven by double reduction worm gearing directly from a worm on the cutter arbor, the feed is determined by the spindle speed and is controlled by the ratio of the worm gearing. Clamping nuts on the cutter arbor on each side of the cutter provide means for adjusting the cutter laterally on the arbor and central with the screws to be slotted. Variation in the diameter of the cutter will cause variation in the depth of the slots to be cut in the screws, and the attachment can be adjusted to or from the cutter on its base, screws and slots being provided for that purpose.

The carrier *A* has a hardened ring *B* in which there are V-grooves for locating the screws to be slotted. Clamps *C* each clamp two screws in the V-grooves and are operated by the screws shown. When screws varying greatly in diameter are to be slotted it is necessary to provide a series of rings *B* having V-grooves of different depths, because the loading range of each ring is adapted for screws having a limited variation in diameter.

For slotting headless screws, a special ring *D* is provided having stop pins *F* for limiting the amount such screws will project from the carrier. The stop pins are held in the ring by setscrews and can be set for screws of various lengths by a depth gage, as at *H*. Ring *D* can be adjusted laterally so that the stop pins will be in line with screws of different diameters. When the screws are longer than can be located by the stop pins, ring *D* can be removed and a smaller ring *I* can be substituted.

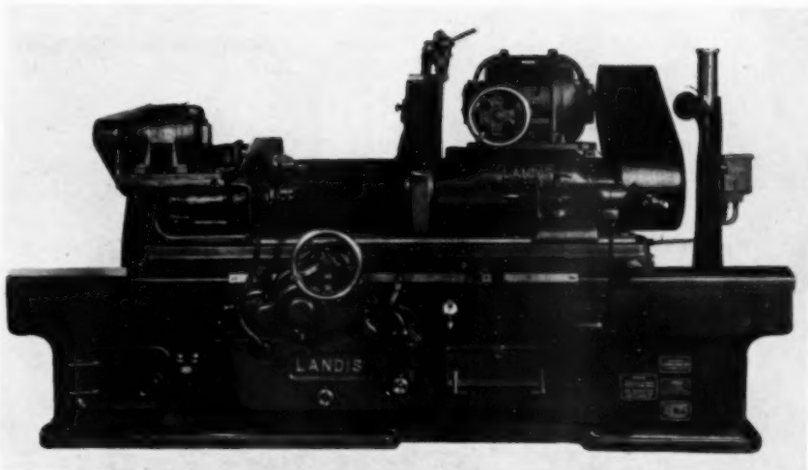
Screws are loaded in the carrier when any of the empty V-grooves are above the neutral position where the screws will not drop out of their own weight. The clamps are released when the slotted screws are in the downward position, at which time they drop out.

Vibration of the carrier due to backlash in the gearing is dampened by the brake *K*, the contact surface of the brake shoe being covered with leather to give it sufficient grip. Pressure of the shoe on the brake is controlled by the spring *L*, the tension of which can be adjusted by nuts on its stud.



The carrier holding the screws to be slotted is driven by double reduction worm gearing from a worm on the cutter arbor

Shop Equipment NEWS



Landis Type D Plain Hydraulic Grinders

The 10-, 14- and 16-in. Type D plain hydraulic grinders are modern high-production machines which may be used for the grinding of spindles and shafts of many types and sizes. Landis Tool Co., Waynesboro, Pa., is the builder. Suggested uses are for grinding of crankshaft line bearings, tinning rolls, camshaft main bearings and motor armatures.

End-wheel spindle drive is through multiple V-belt. Flood-lubricated, cap-type, babbitt-lined, wheel-spindle bearings are used. This feature makes possible the utilization of less wheel spindle clearance than is ordinarily required. A 30-in. diameter grinding wheel is standard. Provision has been made, however, for the use of a 36-in. diameter wheel on 10-in. machines, or a 42-in. diameter wheel on 14- and 16-in. machines.

The Type D hydraulic system is of the dual cylinder type. It provides a range of work table speeds between 6 and 240 in. per min. Due to the use of dual cylinders, one for movement in each direction, the volume of oil in each is constant, and the speed is therefore constant in both directions. Table speeds are regulated by a valve which governs the flow of oil from the end of one cylinder to the corresponding end of the other. A hydraulic straight infeed mechanism is available, although it is not considered standard equipment. When used, it causes the wheel to feed in rapidly until it is about to come in contact with the work, at which time its speed slows down automatically to the predetermined feed and continues to feed in at this slower speed until the base comes against the positive stop.

Drive from the jackshaft to the faceplate in through multiple V-belts. The work-drive motor is of the constant-speed type, a range of 65 to 200 r.p.m. being available by changing the belt and pulleys at the end of the headstock. Work carriage ways are flood lubricated. A small reservoir at the rear of the machine is kept constantly filled with filtered oil from the hydraulic system, the oil feeding by gravity to the ways.

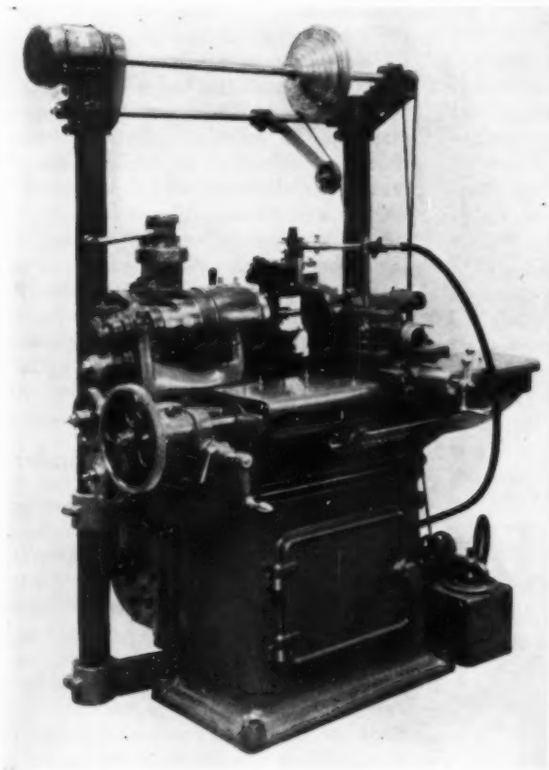
The work centerline of the 10-in. machine is 36 in. from the floor. On the 14-in. machine this distance is 38 in.; on the 16-in. machine, 39 in. The lower portion of the bed is cut out in front, so that the operator may get close to the machine. Type D machines are offered in hydraulic or hand traverse models, and in lengths of 18, 36, 48 and 72 in. The wheel drive motor is either 20- or 25-hp., depending upon the wheel used. The pump drive motor is 3 hp., and the work drive motor either 1 or 1½ hp., depending upon the swing. All are constant-speed motors. Weight of the 10x36-in. size is 12,850 lb.

Landis Model O Chaser Grinder

The Landis Machine Co., Waynesboro, Pa., has added to its line of machines and fixtures for grinding Landis diehead chasers, the Model O chaser grinder. This grinder is suitable for grinding all Landis diehead chasers up to 1¼ in. in width. It is a medium-sized grinder of the bench type, but can be furnished with a pedestal for floor use. Standard equipment includes two grinding wheels, one a 6x2-in. cup-shaped wheel, and the other a 7x½-in. straight wheel, of suitable grade and grain for grinding high-speed steel chasers. Power is supplied by a ¼-hp. a.c., single-phase, 120-volt, 60-cycle, fully-inclosed motor, with a ½-hr. continuous duty rating.

The right-hand side of the machine is fitted with a fixture for grinding the rake and lead angles. Means are provided for swiveling the fixture to any desired angle. The rotatable spindle permits oscillating the chaser against the face of the cup wheel for the grinding operation. A cross feed is obtainable through a hand knob on the left side of the machine bed. A dove-tailed bottom, provided with a hand knob for tightening, holds the chaser in the vise.

Societe Genevoise Thread Grinder



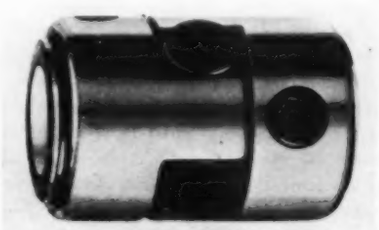
The Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y., has anounced a motor-driven, toolroom-type thread grinder made by the Société Genevoise D'Instruments de Physique, for finish grinding high precision screw threads for external and internal gages and taps and hardened production thread parts. Drive is by a 2-hp. motor which is mounted at the rear of the bed to a backshaft and from there to a cone pulley on the machine. This gives six work head speeds. Eight wheel-spindle speeds are obtained by means of a grooved pulley on the shaft which is driven by 1-hp. motor.

Provided with a correcting device on the front, a large leadscrew, which is protected from grinding dust and dirt, enables the obtaining of an accuracy of lead-screws to plus or minus 0.0001 in. Wet grinding may be done on the machine, for which a water pump and piping are furnished. A diamond truing device is furnished whereby 60-deg. threads, or other angles, can be obtained. A vertical microscope is fitted over the top of the wheel, providing a means for controlling the profile angle of the wheel and work-piece during the grinding process. The grinding wheelhead can be tilted to any suitable angle of helix formed by the thread to be ground.

This machine can be used for grinding outside threads from $\frac{3}{8}$ to 6 in. in diameter and up to 12 in. in length between centers. The grinding capacity for inside threads is from $1\frac{1}{4}$ to 5 in. inside diameter. A corrector for temperature is furnished to take care of variations from 32 to 68 deg. F.

Lovejoy Flexible Coupling

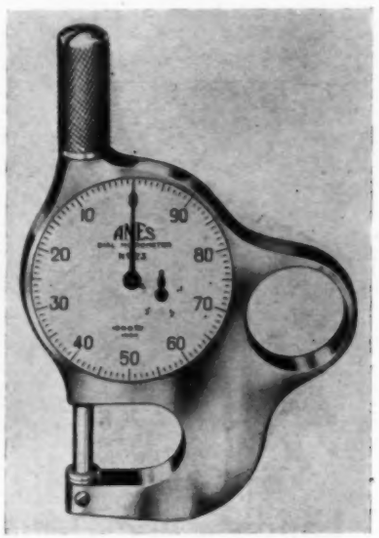
The L-R Type "IA" flexible coupling announced by the Lovejoy Tool Works, 4956 West Lake St., Chicago, Ill., introduces the principle of transmission of torque through resilient cushioning arms of a spider subject to compression. It has convex jaw surfaces that exert a rolling pressure when bearing on the spider arms. Utilizing the variation of compressibility with the thickness depending upon the resilient cushioning materials used, the convex surfaces proportion the spider arms so that the compression is substantially uniform. Thus, each portion of the arm bears an equal share of the load. The jaw faces of the coupling approach each other with uniform wear over the entire surface of the spider arm in such a manner as to



render it useful as a cushioning agent for the metal jaws until the spider is practically worn out. Other features are: three-part construction, two metal flanges and one-piece spider, sufficient resilience to safeguard the connected machines against shocks, overloads and misalignments and quietness of operation. These couplings are made in standard sizes with bores from $\frac{1}{4}$ to 3 in., $\frac{1}{2}$ to 200 hp., at 1,750 r.p.m.

Ames Dial Micrometer

The dial micrometer No. 23, manufactured by the B. C. Ames Co., Waltham, Mass., is thin and compact for a gage of $\frac{1}{2}$ in. capacity. A small hand on the dial face indicates the number of large hand revolutions. A knurled barrel at the top is turned to operate the spindle and to open or close the measuring anvils. This is accomplished with a slight finger motion of the hand holding the gage. The crystal is unbreakable. A dial with fractions and decimal equivalents is attached to the back. The anvils are $\frac{1}{4}$ in. in diameter. Approximate weight is 5 oz.



Hercules Electric Screwdriver

The Buckeye Portable Tool Co., Dayton, Ohio, announces a "Hercules" high frequency electric screwdriver designated as No 21-S. It is used principally for screwdriving on the production line, but with the use of an extra nut socket it may be adapted for light nut running. It can also be furnished with a reversing switch. Specifications for this tool are: 3 phase, 180 cycles, 220 and 110 volts; speed, 500, 750, and 1,000 r.p.m.; capacity, No. 12 and 14 screws, $\frac{3}{8}$ and $\frac{1}{4}$ in. nuts; overall length, 15 in.; weight, $7\frac{1}{2}$ lb.

Wiedemann Type R-4P Deep-Throat Turret Punch

The Type R-4P motor-driven, deep-throat turret punch, announced by the Wiedemann Machine Co., 1815-31 Sedgley Ave., Philadelphia, Pa., is offered in three standard throat depths, 18, 24 and 28 in., special depths being made to order. The machine is furnished with twelve punches and dies up to 1¼-in. diameter, mounted in a revolving turret. An indexing device locks the revolving turret when the punch and die are located centrally under the ram. This locking and unlocking is done by the small lever at the front of the machine. The lever is interlocked with the clutch trip mechanism to prevent operation of the machine, unless the turret is properly positioned and the index lever locked in place. A 90-lb. flywheel is mounted on the alloy steel pinion shaft. All shafts, including the main gear, run in phosphor bronze bushings and are provided with wick feed lubrication.

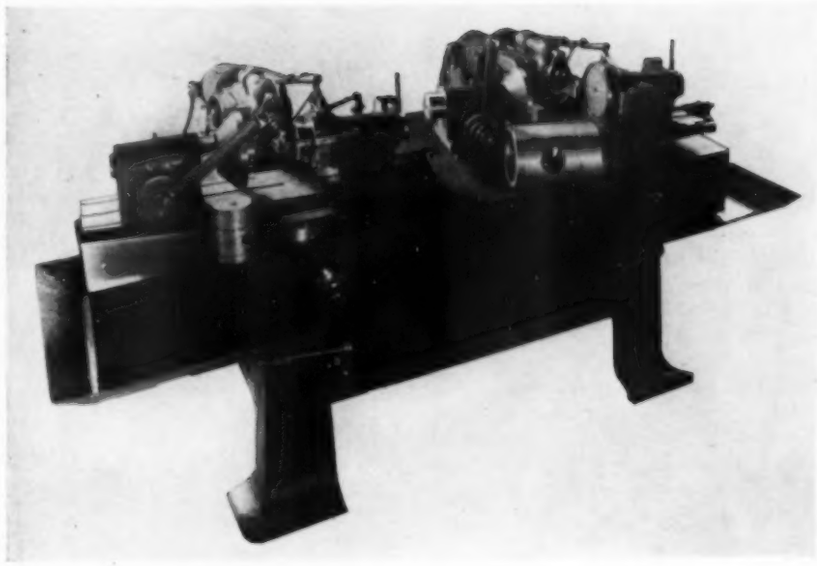
Frame side plates are cut from mild steel with the entire machine finished to jigs, for accuracy and interchangeability. The power-driven upper turret head is a complete single unit, and the motor can be any standard make, ¾ hp., 1,800 r.p.m. Drive is through double V-belts connected to the flywheel. Final drive is by spur gears through a four-tooth clutch having renewable tool steel teeth. Punches can be easily brought down to a center-punched layout by handwheel even on the thinnest sheets.

All machines can be furnished as portable machines, the frame being mounted on 5-in. wheels. Stock supports can be furnished. These are of angle iron 46-in. long spaced 24-in. apart with front and back adjustment, allowing them to project 16 in. in front of the dies. The rear gage bar is 60-in. long and may be adjusted up to the center of the punch by double screws. When ordered with a graduated gage, this is furnished with graduation reading 18 in. in 32ds of an in. each way from the center, the end being adjustable and locked against movement. The gage bar screws are operated by a handwheel in front, each turn equalling ¼-in. movement.

An eight-station turret has been specially developed for thin material when larger openings are to be pierced. Specifications of the R-4P machine are as follows: Clearance between dies and strippers, ⅛-in.; stroke of ram, ⅝-in.; strokes per min., 100; length of machine (28-in. throat) 54 in.; width, 31½ in.; height, 65 in.; net weight (28-in. throat) 2,200 lb.

Punch holders are of special design for the increased duty, with face key for punches, to hold square and other shaped punches securely in correct registration. All bearings have wick feed lubrication

Motor shafts, drill spindle and index fixture spindle are all ball bearing equipped. Coolant for drills is provided by an individually motor driven pump



Millholland Smoke-Hole Drilling Machine

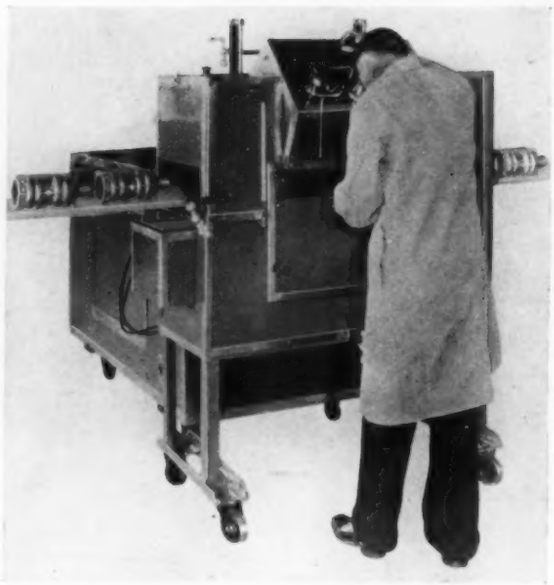
A smoke-hole drilling machine for passenger car, truck and diesel pistons has been developed by the Millholland Sales & Machine Co., Indianapolis, Ind. Two No. 2 Millholland automatic drilling units with ½-hp. motors attached drill the holes and actuate the ratchet index fixtures. The operation of drilling and indexing is automatic after the piston has been loaded and feed started. After the required number of holes has been drilled, the feed mechanism is quickly disengaged.

Fixtures are mounted on swivel bases to accommodate varying degrees of angularity of smoke holes found in different styles of pistons. Adjustment for length and size is provided to accommodate from the smallest passenger car piston up to 8-in. diesel pistons, 11 in. long. Change of ratchet plates and drilling cams provide for any number of holes and for any drill depth. On large pistons each drilling unit will drill 12 holes 1¼-in. deep in 2¼-min. Quick clamping fixture locks are provided.

Adrian X-Ray Machine

Manufacturers can now "see through" their products on the production line and detect flaws or pieces of foreign materials, according to an announcement by the Adrian X-Ray Manufacturing Co., 3535 North Palmer St., Milwaukee, Wis. As products pass through the machine on a conveyor belt, the operator looks through an eye-piece to get an interior view of each unit by fluoroscopic means. Any piece which does not come up to the requirements can be marked for rejection by means of a pointer. The machine also has a radiograph attachment for making X-ray photographs. Fluoroscopic work has been done through ¼ in. steel plate, and radiographing with 1 in. steel plate.

Although it has a voltage capacity of 150,000 volts, the unit requires only about the same amount of current necessary to operate two ordinary flat irons. Special tubes have been constructed and a cooling arrangement devised which permit continuous operation of the machine during working hours.



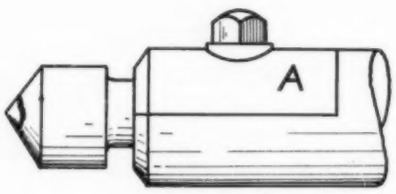
Operation of this X-ray machine requires no technical knowledge, and the operator is in no way exposed to the rays while inspecting work

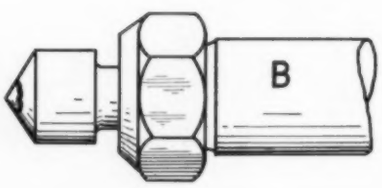
"Trumore" Diamond Tool

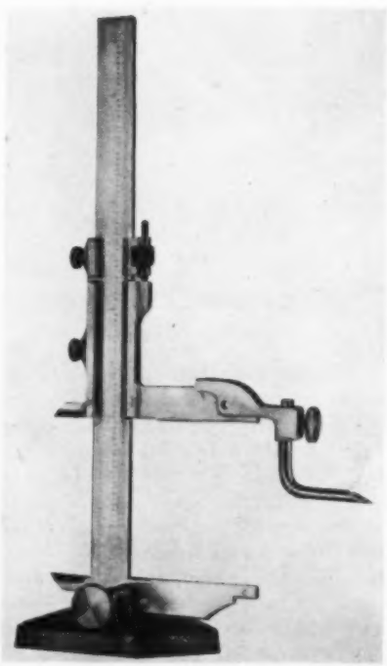
F. F. Gilmore & Co., 112 Dartmouth St., Boston, Mass., announce the addition of a ball-jointed tool in their line of "Trumore" diamond grinding wheel dressers. With the ball-joint, the operator can loosen one nut and bring a sharp corner of the diamond into correct position against the wheel. The nib can be turned in any direction and rotated. Elongated diamonds are used with the grain set lengthwise to eliminate cracking or chipping. The diamond is surrounded by a special alloy with holding power great enough so that only a comparatively thin shell of metal is required.

Mauser Convertible Height Gage

An improved type of convertible height gage has been added to the line of Mauser precision tools which is handled in this country by the George Scherr Co., 128 Lafayette St., New York, N. Y. The tool consists of a toolmakers' caliper of standard Mauser make which is provided with knife-edge points at the rear of the jaws. For use as a height gage, a lapped base is furnished in which the caliper is located and held by a centering clamp



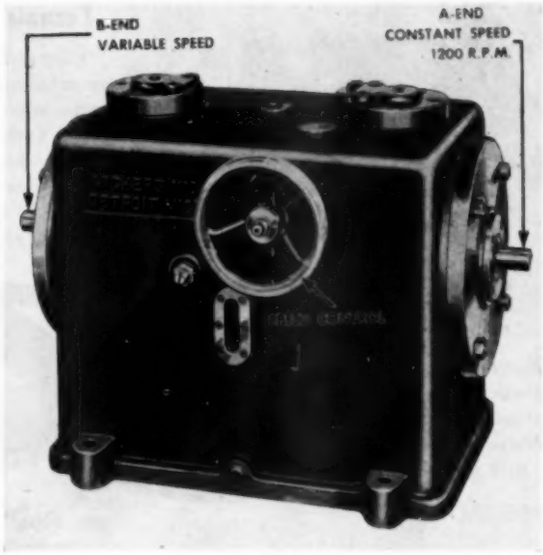




screw. The scribing needle is of angular design and adjustable in such a way that proper setting of the scriber will result in direct reading of the scale. Verniers are provided for reading in 0.001 and 1/128 in.

"Hormel-M" Abrasive Band Grinder

This abrasive band grinder, known as the "Hormel-M," developed by the Walls Sales Corp., 96 Warren St., New York, N. Y., is applicable to a variety of operations, including roughing, smoothing and fine finishing. An eccentric tension device, lever operated, permits quick change of abrasive bands. An adjusting mechanism provides band alignment. Vibration and tipping of the machine are prevented by a supporting leg. All angles may be obtained by means of an adjustable bevel attachment. Drive is by a ¼-hp., 1,750-r.p.m., heavy-duty motor, equipped with a ⅝-in. shaft. The head is specially designed to permit cool operation and yet prevent dust and dirt from getting into the motor. The table size is 4½x9 in.; belt size is 4x36¼ in. The grinder is equipped with an Alemite greasing system, complete with grease gun.



This variable speed unit may be operated manually or by hydraulic, mechanical or electrical remote control

Vickers Hydraulic Variable-Speed Transmission

The hydraulic variable-speed transmission, manufactured by Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich., permits securing of any desired speed between 5 and 750 r.p.m. by simply turning a handwheel. This varies the stroke and delivery of a multiple piston pump. Additional adjustments permit speeds up to 2,500 r.p.m. Hydraulic, mechanical or electrical remote control can be substituted to eliminate manual operation. Minimum power is required regardless of the load, because the torque is automatically controlled and there is no throttling or bypassing of the oil.

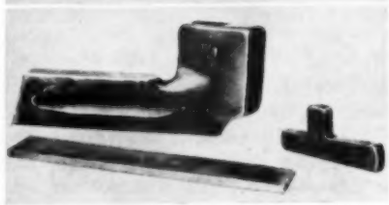
Both the *A* and *B* ends can be provided for rotation in either direction, being changed on the job without additional parts. Units can also be provided with mechanism for instantaneous change of direction.

Standard units have a maximum output of 6 hp. continuous duty at 1,000 lb. per sq.in. pressure and 7½-hp. intermittent service at 1,250 lb. per sq.in. pressure. Drive is by a direct-connected 1,200 r.p.m. motor. Over-all dimensions of the 6 and 7½ hp. units are 25⅞x17⅛x17½ in., being variable to suit individual requirements.

Inverted Parting Toolholder

The holder for parting or cut-off tools, placed on the market by the Inverted Tool Holder Co., 1230 East 109th St., Los Angeles, Cal., is so designed that the tool is held in an inverted position, and the lathe or machine spindle is run backward so that the thrust of the tool keeps the rotated work load in a normal position. The spindle is kept seated in its bearing and chattering from spindle play is reduced.

Other claims for the inverted tool are: clear vision for the operator, chips fall away from the work, saving on toolbit breakage, elimination of clearance worries and less frequent grinding of the tool bits. This toolholder incorporates a wedge bit fastening that is simple to operate. A tap backward on the wedge knob tightens the wedge so that the tool is firmly held in position. The wedge is tapped forward to release the toolbit.



Lacey Universal Die Set Machine

The universal die set machine, announced by the Lacey Mfg. Co., Bridgeport, Conn., is mounted on a pipe frame having ball-bearing castors with braking arrangement. The housing or yoke carries a rack and pinion which is operated by means of a hand wheel. Traverse T-slots for clamping the die shoe in position are formed in the ribbed table. A clamping device holds the punch holder shank, in the rack.

This machine may be easily moved from the press to the die-maker's bench or wherever it is needed. Separating the punch holder from the die shoe by means of die hooks has always been a difficult operation requiring two men if the die set is very heavy. This machine will do the work without effort, eliminating sideward strain on the pillar posts and without jamming the pillar posts. Alignment is maintained between the punch holder and the die shoe. Shearing in small punches may be accomplished on the machine.

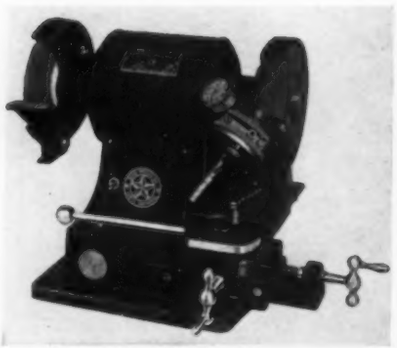
Wade Isometric Sketch Paper

The improved isometric sketch paper, announced by the Wade Instrument Co., 2274 Brooklyn Station, Cleveland, Ohio, is designed for making quickly three-dimension scale drawings. All axes are spaced 1 in. apart and have ¼ in. subdivisions. A double-line Y shows the center and isometric principle. Lengths and widths are measured on the isometric horizontals and all heights on the verticals. Only close dimensions need be noted, as all lines are to scale. Freehand drawings in ink or pencil stand out distinctly on this paper.

Star Precision Drill Grinder

The capacity of the precision drill grinder, manufactured by the Star Machine & Engineering Co., Bloomfield, N. J., is 81 sizes of drills including 25 fractional sizes from 1/8 to 1/2 in. inclusive, numbered drills from 1 to 30, and all letter-size drills. The drill is inserted in the chuck the proper distance, as shown by the indicator point, and the chuck rotated so that one lip comes to the position shown by the zero dial reading on the indicator. The cam handle is moved from right to left, and at the same time the chuck carriage is fed to the required depth of cut. By moving the cam handle through its entire arc, the grinding of one lip is completed. The same procedure is followed in grinding the second lip, except that the chuck carriage should not be moved.

The grinder will grind drills to the following angles and clearance for cast iron and steel: 59 deg. angle of the lips, 120 deg. to 135 deg. angle of the drill point and a 12 deg. clearance of the lips. The 59 deg. angle can be changed by adjustment of the graduated compound rest to the desired angle. This adopts the grinder for counter-sinks and for drills for cutting soft materials. Grinding is done on a peripheral face which lessens the tendency to burn the drill. An extra-coarse wheel is mounted on the side of the motor opposite the chuck for roughing down of damaged or broken drills.



Right—Electroplating brush equipped with nickel anode. Below—Motor-generator set with buffing wheel

Cutler-Hammer Type V1 Small Drum Switch

Small size and high capacity rating are features of a drum type reversing switch developed by Cutler-Hammer, Inc., 429 N. 12th St., Milwaukee, Wis. This switch, known as Bulletin 9441, Type V1 is of the across-the-line type, with "twin-break" contacts and molded arc barriers. It can be furnished in either a standard inclosure or as a skeleton drum with mounting plate for built-in applications on machines. Movable contacts are removable, without the use of tools. The stationary contacts are assembled into a molded base, so that when they require renewal, the entire base is replaced by simply removing three screws.

A drum switch is applicable to almost any type of single phase, polyphase or d.c. motors. It can also be used as a three-pole, double-throw switch by removing the jumpers. Ratings are: for single-phase, 1 hp., 110 volts, 1½ hp., 220 volts; for polyphase, 1½ hp., 110 volts, 2 hp., 220 volts, 440 or 550 volts; for d.c., 1 hp., 115 or 230 volts.

Fernald Electroplating Brush

Electroplating by the brush method, as introduced by the Fernald Manufacturing Co., Inc., 72 Cortlandt St., New York, N. Y., under Conlin patents, makes it possible to retouch parts of damaged stock without the necessity of displacing and replacing fixed objects, especially large objects which are expensive to convey, and sometimes too big for the average plating tank.

In brush plating the anode is contained in the brush bristles so that when the brush is dipped in the electrolyte, conditions obtained are very similar to tank plating. The brush bristles act as retainers for holding the electrolyte, and the work itself acts as one of the sides of the tank.

If a fine finish is desired, care must be given to the preparation of the work to be plated; it should be ground, buffed and polished. However, if the plating is a protective measure, these precautions are not necessary. In both cases the surface must be chemically clean. Instead of removing the old plating or dirt accumulation by grinding, it is possible to reverse the plating operation and, by making the work the anode in a strip solution, completely remove all foreign matter.

The equipment necessary to carry out electroplating by the brush method may be divided into three classes: current supply, means of polishing, and brushes, electrolytes and other accessories. Current source may be from a number of dry batteries, one or more storage batteries, a generator, d.c. lighting system, or by reduction and rectification of a.c.

The company has developed a motor-generator outfit to meet the demands of constant usage. For cleaning and buffing a flexible drive shaft may be connected to the outfit. A rectifying unit is available to convert a.c. to d.c., which is required in a plating operation. The electroplating brush is equipped with a nickel anode.

A complete line of accessories is handled by the company, including, electrolyte solution for the plating of copper, nickel, cobalt, lead, zinc and cadmium, and abrasive and polishing compounds for cleaning the work.

The Round Table

TRAINING MEN

"I see you've got a couple of new men on the boring machines, Al. Thought you had trouble getting skilled men."

"Yes to both remarks, Ed. I'm trying a new plan with those men."

"Such as—"

"Well it's this way, Ed. These men have had some experience but they are not first class men, and they know it. Couldn't get men who were. So I'm having Bill Pritchard take them under his wing."

"Sort of straw boss, eh, Al? But what happens to his work while he's wet-nursing the two greenhorns?"

"Call him anything you like, Ed. And of course he can't do as much work with two cubs on his hands as he could alone. But you can't eat your cake and keep it too."

"Darned if I see how you expect to make that work out, Al, unless you get these men for practically nothing."

"Not as bad as that, Ed. Of course they don't get full wages, they don't expect it."

"But don't they resent being coddled as though they didn't know anything? I'd have hated to have another shop man bossing me."

"Do they look as dumb as that, Ed? Bill is showing them how to make more money. And they'll get it when they earn it."

"But we're paying for it by losing part of Bill's time just to have them draw more money when he gets through with them."

"This seems to be one of your dumb days, Ed. Do we pay Bill top wages because we love him or because he can earn more for us by getting more out of our machines? When these two men can earn as much as Bill we'll be making more out of our machines."

"So we're losing part of Bill's time now in the hope of making it up later on the two new men."

"In a way that's true, Ed. But we're also preventing a lot of work being spoiled if we left the men without Bill's eagle eye watching over them."

"Might be cheaper to hire good men and pay them top wages."

"It might, Ed, but that isn't the problem. We can't get skilled men, and we've got Bill and two learners."

Is Al's plan of training semi-skilled men sound? Is there a better way to handle the problem?

DISCUSSION

What Is Productive Labor?

I have in mind a very successful concern that has been going well all through the depression. It would appear to the uninitiated that this concern had about two engineers, salesmen, etc., to every machine operator. Amazement is expressed at the immense overhead. But when it is analyzed, the only difference between the machine operator and the draftsman is, that one uses metals and the other uses pencil and paper—both have to use their heads. In either case, the machine or the drawing table would be useless without the operator or the draftsman.

Where would we be if we didn't know what things cost? How would the shop run without planning? In my estimation, overhead would cover taxes, light, power, selling expenses, etc., and here someone will pick me up and call these things burden or something. If the salesman isn't the greatest producer when it comes to continuing the life of the organization, I'd like to know why not.

Any worker necessary to make the wheels go round or anyone in the office, boss or otherwise, necessary for the functioning of the concern is productive. There is no such thing as nonproductive labor, unless it is someone who is holding a job and drawing a salary without delivering useful work.

—J. C. P. Bode.

It is immaterial whether a man gives his service in the office or the shop so long as his efforts effect a saving in the total cost of the product.

In a small growing plant, it often occurs that some additional help is needed for some particular service that is of an intermittent order or not of sufficient volume to warrant the expenditure for a competent man's full time, but a man can be used to advantage who is capable for the particular service required, and is sufficiently capable all around to fill in on other jobs and, in that way, make himself profitable to his employer.

As the plant grows the need for this class of help decreases, and the large

plant will have need of full time work for specialists in all departments and generally find it to their advantage to follow this latter course.

Incidentally the all around man referred to is harder to find than the specialist in this day and age. However, right here is where an experienced elderly man is most likely to make good for himself and profits for the shop. —JOHN MARK MAY.

One-Man Shop

Small shop owners make the serious mistake of keeping everything pertaining to the business under one hat. And this applies to our friend Al, who has been away from the shop on account of illness.

Part of an executive's duties should be to train at least one man to be able to take his place at any time. I consider it practicable to give a man limited authority and to make him feel a sense of responsibility, as it gives him training to be able to assume complete responsibility when given a full time executive's duties.

Some time ago we had occasion to send some tool work to several outside shops, one of which proved to be a one-man shop. From time to time our follow-up man sought information as to the progress of the work. His reports showed numerous calls at this one-man shop, because the one man who could give any information would be out when our man called. Needless to say, that one-man shop received no more work from us. It seems as if the best way for a small shop to stay small would be to keep all information under one hat. —C. F. STAPLES.

If Al is really interested in safeguarding the interests of his stockholders, he should try to insure the continuity of the business by appointing an able and capable understudy to take his place when accident or illness might keep him away from the shop for an indefinite time.

The man appointed should be one who has had the benefit of Al's coaching in the matter of shop routine and, in the more important one, of handling men. He should be invested with full authority and should be held strictly responsible for the conduct of the shop during Al's absence. Giving a man limited authority is not conducive to good will or good discipline. He should either be a foreman or a workman; there should be no compromise.

—ROBERT KNOTEK,
Assistant Toolroom Foreman,
Fisher Body Corporation.

My opinion concerning the operation of Al's one-man shop is that Al should designate certain men to serve in an advisory capacity when he is around, but to function with full authority in charge of the shop when he is either absent or busy with other matters of importance. These men should receive a slight increase in pay.

This is a sound set-up for the small shop for several reasons. First, it insures that there will be a steady flow of work through the shop at all times, whether Al is present or absent; second, in a small shop doing a wide variety of work, the men who are designated for such duties will naturally be highly skilled and will have considerable experience; third, the additional authority given these men should increase their pride in their work; and fourth, such a set-up would not require employment of additional nonproductive men.

—MARTHA R. BRYDEN,
Bryden Company.

Change in Design

I know the bull-headed old fellow about whom Al told the handwheel story. He had made a plan to supply some needed machines quickly, and part of his plan was to get out a standard design and not to change a single detail for anyone, well knowing that production would be delayed if he did.

Four of the handwheels referred to were of the same size, the only differences were in the diameters of the bores and that three of them were keywayed and one was setscrewed. But the plan this man followed required four separate drawings and four patterns for the handwheels, each with its own number, for no other reason than that some time someone might make a mistake and have too many of one kind and not enough of the other kind of handwheels ready for assembly, causing delay.

At one time I offered Brown & Sharpe an order for 50 of their standard hand milling machines, provided they would put hydraulic escapements on the tables so that a steady feed could be maintained over work greatly varying in width. They declined the order and I think they were right, although I did not think so at the time.

—LUCIEN I. YEOMANS.

Whether or not a manufacturer should modify his standard product to secure an order cannot be answered by a plain "Yes" or "No." Ignoring the question of whether the product will be impaired or improved by the change, will the order stand any extra manufacturing costs entailed by the change? If the change impairs the product, will the customer blame the manufacturer for any defect arising therefrom? If the manufacturer has to render after-sales service gratis, then he may find that, irrespective of the amount of the original order, his profits will be eaten up by unsatisfactory (to both parties) alterations and maintenance.

If the altered product is not of standard efficiency, will the customer complain to third parties, who are perhaps prospective customers of the manufacturer, without explaining the reason for the defects? An order of any magnitude may well be refused if such is likely to happen, for such complaints may cause great harm to the manufacturer's reputation, while affording but little opening for redress. Of course, if a manufacturer is absolutely depending upon the order to keep his works going, he may risk this and can perhaps save himself to a certain extent by not affixing his usual name plate or trademark to the changed product. If the change is essential to adapt a machine to the customer's purpose, the manufacturer should go into the matter carefully—he may be able to make other changes to adapt his machine to the new purpose without rendering it less efficient. In fact, he may learn something in doing so.

—ROBERT HUTCHESON.
Kenton, Middlesex, England.

Group Training

Al's plan of establishing group training schools does not seem practicable because few, if any, manufacturers could be found who would be willing to sponsor such a move. Under present conditions, employers are more concerned with keeping the finished mechanics busy than they are in training new men. Besides, why waste time in training men who may never work at the trade?

While many ambitious young men now employed might be eager to take advantage of the training offered, they would still be looking for jobs. After several months of training at the manufacturers' expense, many of them would drift into other lines.

In the larger cities there are many manual training schools for those who wish to learn trades, and most of the young men who attend the night classes of these schools are employed in some capacity or other at the trades about which they are seeking further knowledge. —W. J. OWENS.